Regency ELECTRONICS INC.

# SERVICE MANUAL

Board 600-386 Front sect.
700-164 Rear sect.

## MODEL ACT-R10 H/L/U
## MONITORADIO RECEIVER

7707 RECORDS STREET
INDIANAPOLIS, INDIANA 46226

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# MONITORADIO RECEIVER

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## SECTION 1 SPECIFICATIONS AND CIRCUIT DESCRIPTION

### 1-1 SPECIFICATIONS (Subject To Change Without Notice)

RECEIVER -MODEL ACT-R 10 H/L/U

| | |
|---|---|
| Frequency Range | Low Band; 30-50 MHz |
| | High Band; 150-174 MHz |
| | UHF Band; 450-470 MHz |
| Antenna Impedance | 50 Ohms |
| Channels | 10, Crystal Controlled |
| Sensitivity (At Tune-Up) | Low Band; 0.5μv (max.) |
| | High Band; 0.6μv (max.) |
| | UHF Band; 0.7μv (max.) |
| Frequency Separation | |
| Low Band | 6 DB Bandwidth; 33-47 MHz |
| | 10 DB Bandwidth; 30-50 MHz |
| High Band | 6 DB Bandwidth; 8 MHz |
| | 10 DB Bandwidth; 12 MHz |
| UHF Band | 6 DB Bandwidth; 8 MHz |
| | 10 DB Bandwidth; 12 MHz |
| Selectivity (I.F.) | 6 DB Down; ±7 KHz (min.) |
| | 50 DB Down; ±18 KHz (max.) |
| Spurious Rejection (excluding Primary Image) | 50 DB |
| AFC Range (UHF Band Only) | Approx. ±5 KHz |
| Modulation Acceptance | ±7 KHz (min.) |
| Intermediate Frequencies | 1st I.F. -10.7 MHz |
| | 2nd I.F. -455 KHz |
| Squelch System | "Noise Operated" |
| Audio Output (3.2 Ω Speaker) | 1 Watt @ 10%, or less, |
| | Distortion; 2 Watts, maximum |

SCANNER

| | |
|---|---|
| Scan Rate | Approx. 15 Channels per sec. |
| Scan Delay | Approx. 1/2 sec. |

POWER

| | |
|---|---|
| Voltage Requirement | 117 VAC (±10%), |
| | 60 Hz, 13 Watts Max. |
| | 13.8 VDC (±10%) |
| Current Requirements | @ 13.8 VDC |
| Receiver (Squelched) | 180 MA. |
| Receiver (Max. Audio Output) | 600 MA. |
| Fuse Size | 1.5 Amp., 3AG |

SEMICONDUCTORS

| | |
|---|---|
| Integrated Circuits | 5 |
| Silicon Transistors | 24 |
| Field Effect Transistor | 1 |
| Diode (Total) | 29 |
| Zener Diodes | 2 |
| Rectifier Diodes | 2 |
| Varactor Diode | 1 |

GENERAL

| | |
|---|---|
| Front Panel Size | 6 1/2" x 2 5/8" |
| Depth (including Knobs and Rear Panel Connectors) | 9 3/4" |
| Antenna Connectors | Motorola Type |
| Speaker Size | 2" x 6", 8 Ohm |

## 1-2 CRYSTAL SPECIFICATIONS

Minature plug-in crystals are utilized in the receiver. Because of the high accuracy (close tolerance) required, Shepherd Industries' crystals are recommended. If the crystals are ordered from Regency, it is only necessary to specify Part No. 301-532 for High Band crystals and the desired receive frequency, or Part No. 301-542 for Low Band crystals and the desired receive frequency, or Part No, 301-603 for UHF (450-470 MHz) crystals and the desired receive frequency, or Part No. 302-187 for UHF (470-500 MHz) crystals and the desired receive frequency.

If desired, the crystals may be purchased from other manufacturers. The following specifications must be included in the order:

High Band Crystal:

a. Crystal frequency, determined as follows:

$$\text{Crystal frequency} = \frac{\text{Channel frequency} - 10.7\ \text{MHz}}{3}$$

EXAMPLE:

$$\text{Crystal frequency} = \frac{155.55\ \text{MHz} - 10.7\ \text{MHz}}{3} = \frac{144.85\ \text{MHz}}{3} = 48.2833\ \text{MHz}$$

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 ohms
f. Drive Level of 2 MW
g. Holder: HC-25/U

Low Band Crystal:

a. Crystal frequency, determined as follows:
Crystal frequency = Channel frequency +10.7 MHz

EXAMPLE:
Crystal frequency = 39.5 MHz +10.7 MHz = 50.2 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Series resonance minus 450 Hz
e. Maximum equivalent series resistance of 35 ohms
f. Drive Level of 2 MW
g. Holder: HC-25/U

UHF Band Crystal (450-470 MHz):

a. Crystal frequency = $\frac{\text{Receive frequency -10.7 MHz}}{9}$

EXAMPLE:
Crystal frequency = $\frac{458.00 \text{ MHz } -10.700 \text{ MHz}}{9}$

Crystal frequency = 49.70000 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Parallel resonance - 18 PF load capacity
e. Maximum equivalent series resistance of 35 ohms
f. Drive Level of 2 MW
g. Holder: HC-25/U

UHF Band Crystal (470-500 MHz):

a. Crystal frequency = $\frac{\text{Receive frequency -10.7 MHz}}{10}$

EXAMPLE:
Crystal frequency = $\frac{485.10 \text{ MHz } -10.7 \text{ MHz}}{10}$

Crystal frequency = 47.44000 MHz

b. Frequency Tolerance of .001%
c. 3rd Overtone
d. Parallel resonance - 18 PF load capacity
e. Maximum equivalent series resistance of 35 ohms
f. Drive Level of 2 MW
g. Holder: HC-25/U

## 1-3 CRYSTAL INSTALLATION AND BAND PROGRAMMING

Prior to installing a crystal, the receiver's cover will have to be removed. To remove the cover, first remove telescopic antennas if they are installed. Second, unscrew the two large bolts located at the sides of the unit. The cover may then be slipped off by sliding it toward the rear of the unit.

Insert the crystal in the proper socket pins as indicated on the Crystal Location Diagram. See diagram 3-7. The number by each pair of sockets matches the channel number on the front panel.

If the crystal inserted is for the Low VHF Band (30-50 MHz), place the proper color-coded wire and socket onto the proper Low Band pin (row of pins nearest front of unit); if the crystal is for the High VHF Band (148-174 MHz), place the proper color-coded wire onto the proper High Band pin (middle row of pins); if the crystal is for the UHF Band (450-470 MHz), place the proper color-coded wire onto the proper UHF Band pin (row of pins near the rear of set). See Crystal Location Diagram 3-7. Be sure that each channel has its color-coded wire programmed properly with respect to crystal installed. Reading from left to right (Channel 1 through 10), the color-coded wires should be in the order of brown, red, orange, yellow, green, blue, purple (or violet), pink, white and black.

NOTE: If a particular channel is not used (in other words, there is no crystal installed for that channel), the band selection wire must still be connected to either a High Band, a Low Band pin or to a UHF Band pin. Thus, for proper scanner operation, all of the band selection wires MUST be connected, even though not all channels are used.

As shipped from the factory, the first three channels are programmed for Low Band, the next four (channels 4 through 7) are programmed for the High Band and the last three (channels 8 through 10) are programmed for the UHF Band. If desired, this arrangement can be changed to any combination of High, Low or UHF Band channels.

After the crystals are installed and any necessary band programming changes are completed, reinstall the cover.

## 1-4 MAIN BOARD

Q101 is a Low VHF Band RF amplifier with broad-band tuned circuits in its input and output circuitry. The output of the RF amplifier is coupled to the input of the Low VHF Band mixer, Q102.

Q103 is a High VHF Band RF amplifier with broad-band circuits in its input and output circuitry. The output of the RF amplifier is coupled to the input of the High VHF Band mixer, Q104.

Q105 is the UHF Band Field Effect RF transistor used in the common gate configuration. Q105 has broad-band tuned circuits in its input and output circuitry. The output from the RF amplifier is coupled to the input of the UHF Band mixer, Q106.

The first L.O. (local oscillator), Q107, uses third overtone crystals and operates on all channels, whether High, Low or UHF. For Low VHF Band signals, the fundamental frequency of the crystal is taken off the Emitter of Q207 for injection. For High VHF Band signals, the third harmonic of the crystal is coupled off the collector of Q107 for oscillator injection. For UHF Band signals, the third harmonic of the crystal is coupled off the collector circuitry of Q107 and is coupled to the base of Q108. Q108 is a tripler which multiplies the 3rd harmonic of the oscillator by three for use as the ultimate injection frequency. The radio is switched between Low VHF Band, High VHF Band and UHF Band by transistors Q113, Q114 and Q115. When Q113 is conducting, operating bias is applied to Low VHF Band RF amplifier and mixer. When Q114 conducts, operating bias is applied to High VHF Band RF amplifier and mixer. When Q115 conducts, operating bias is applied to the UHF Band oscillator - multiplier, AFC circuitry and mixer. Conduction of Q115, Q114, and Q113 is determined by the Band Programming pins. A pin for each particular channel is connected to either the Low, High or UHF row of pins. When that particular channel is scanned the Low, High or UHF section is turned on depending on the band programming.

A crystal is electrically connected to the oscillator circuit when its associated diode is forward biased. Until the scanner reaches that particular channel, the diode is back biased and prevents the oscillator from operating on the crystal's frequency. When the respective channel is reached, the scanner's output line provides a low resistance path to ground. which turns the diode on (forward biases it) and effectively connects the crystal into the oscillator circuit.

The automatic frequency control circuit (AFC), UHF Band only, consists of Q109, Q110, Q111 and CR111. Q110 and Q111 form a differential amplifier. The voltage at pin 1 of IC102 is determined by the amount the signal is off frequency; this is called an error voltage. The error voltage is amplified by Q109 and applied to CR111. CR110 is a voltage dependent capacitor, or varactor, in the oscillator circuit. When the voltage applied to CR111 changes, the frequency of the oscillator is changed.

The second L.O. frequency is normally 10.245 MHz. In cases where interference is encountered from a signal approximately 910 KHz from the desired frequency, the second L.O. may be changed to 11.155 MHz. If the second L.O. is 10.245 MHz, the error voltage is taken from the collector of Q111. If the second L.O. has been changed to 11.155 MHz, the error voltage is taken from the collector of Q109. The correct combination can be determined by checking the frequency stamped on the second L.O. crystal, (Y111).

The output frequency from the first mixers is 10.7 MHz, the first IF frequency. It is filtered by L122, L123 and L124 before it is fed to an Integrated circuit IC101, which contains the second mixer circuitry and the second L.O. circuitry, normally operating at 10.245 MHz. In some locations where a strong Image signal has been encountered, this oscillator's frequency is moved to 11.155 MHz. (The crystal frequency is stamped on the top of the crystal).

The 455 KHz output of IC101 (terminal 5) is coupled through a tuned circuit to the input of the ceramic filter, CF101. CF101 is a narrow-band filter centered at 455 KHz. The excellent bandpass characteristics of CF101 provode for very good adjacent channel rejection. The output of CF101 is amplified by Q116 and coupled through another tuned circuit to the input of Integrated circuit IC102. IC102 is a series of amplifiers providing approximately 60 DB gain at 455 KHz. Also included in IC102 is the limiting circuitry and a Quadrature Detector circuit. L128, connected between terminals 2 and 12 of IC102, is the adjustable Quadrature coil.

The audio output from IC102 (terminal 1) is coupled to the input of the audio amplifier circuit and to the input of the noise-operated squelch circuit.

Transistor Q117 is an amplifier whose frequency response extends from approximately 5 KHz to 25 KHz. Q117 amplifies the "noise" occuring in this frequency range. The noise is coupled to the base of Q118. Q118 is used as a detector which rectifies the amplified noise and produces a DC voltage at its collector. When the DC voltage at the collector of Q118 is positive and of sufficient value to provide base bias for Q119, Q119 turns off and removes forward bias from diode, CR113 and leaves it back biased. This action prevents audio from reaching the speaker and the receiver is squelched (muted). When a signal (carrier) arrives, the output from the detector Q118 is reduced to the point where the DC voltage at the base of Q119 is no longer sufficient to cause Q119 to conduct.

At this time, CR113 is forward biased and allowed to conduct normally and the audio output of the unit is heard. Audio is applied through the volume control to IC103. IC103 is an Integrated circuit containing a power audio amplifier, gain is internally fixed at 34 DB or 50 times and the output is short circuit proof with internal thermal limiting. The output of IC103 is connected to an 8 ohm internally mount4d speaker. An external speaker can be connected to the unit, no less than a 8 ohm speaker is recommended for optimum performance.

The squelch tail circuit consists of R184, CR112, C170 and R185. This circuit is used to keep the squelch circuit open for a short time after the station signal goes off. The purpose of the squelch tail circuit is to prevent the squelch circuits from chopping very weak signals, especially mobile signals. The timing of the squelch tail can be changed by changing the value of C170. Removing C170 from the circuit will remove the squelch tail completely.

Five basic functional circuits make up the Scanner system. They are: a 4-bit binary counter, a binary coded decimal to one of ten decoder/driver, a lamp detector, a three-speed clock and a clock inhibitor.

The 4-bit binary counter (IC104) has four outputs (pins 8, 9, 11 and 12) and two inputs. One of the inputs (pin 1) accepts clock pulses and the other one (pin 14) accepts pulses from pin 11 of the counter. The counter counts the clock pulses (up to 16) and provides a binary-coded decimal (BCD) output for each input pulse. This is basically accomplished by having four divide-by-two sections (Flip-Flops) interconnected in a series circuit.

There is a specific combination, in a binary form, of these counter outputs for each channel. The Decoder/Driver (IC105) converts the BCD information into decimal configuration (0 through 9) and provides the "Low" output necessary to turn on the channel lamp and diode switch for the crystal. Only one Decoder/Driver output is low at any one time; all other outputs are "high" or near the supply voltage.

The duration for the lamp to be on is dependent upon the position of the channel switch and the Scan/Manual switch. If the channel switch is set to the "OUT" position, the lamp does not light at all and the Lamp Detector (Q120) remains cut off (no collector current). The clock runs at its FAST speed (approximately 1200 Hz) and the receiver's oscillator and squelch circuits can not react quickly enough to stop on that channel even if a RF signal were present.

If the channel switch is in the "IN" position, the channel lamp lights and the Lamp Detector (Q120) conducts, forcing the clock to run at its NORMAL (approximately 15 Hz) scan speed. Thus, the lamp is on long enough to reach normal illumination and the receiver's oscillator and squelch circuits can react quickly enough during this relatively long period of time to an incoming RF signal. It should be noted that the Clock runs at its FAST speed except when scanning through an active channel. In other words, until the Lamp Detector (Q120) determines that a channel lamp is drawing current, the Clock is operating in its FAST mode and it does not slow down to its NORMAL scan speed until it actually is partly into an active (lamp lit) channel.

When an RF signal is present, squelch is "broken" and a positive voltage is fed to the Clock Inhibitor (Q121) which then stops the clock from running. Thus, as long as an RF signal (carrier) is present, the clock is stopped and the Counter is not operative. After the RF signal is gone, a delay to the Clock starting again is provided by capacitor C179. This delay permits a short interval of a "stopped" clock so that another RF signal responding to the first signal (for example a mobile replying to the base station) can come on channel without the scanner going through all of the other channels first.

The Clock (pulse generator) circuitry is primarily a unijunction oscillator. Its basic speed (frequency or period) is determined by R197 and C181, which is the FAST speed. Its NORMAL speed is determined by R197, C180 and C181. When Q122 is turned on (Q121 turned off, Q120 turned on), C180 is effectively added to the timing circuit of the clock, forcing it to run much slower (approximately 15 Hz).

The Clock Inhibitor, Q121, stops the Clock when it is conducting and its collector goes low (near ground). This provides a low voltage path to ground for the Emitter of the unijunction (Q123). When the Emitter of Q123 is below a certain value, the unijunction ceases to oscillate. It can be considered a solid-state version of the relaxation type oscillator.

For normal scanning operating, the Scan/Manual switch connects the carrier delay capacitor (C179) to the Clock Inhibitor's collector circuit. For manual operation,

C179 is connected in parallel with C180. Also, fixed voltage is applied to the base of Q121 which is turned on (conducting), thus stopping the Clock. The when the Step switch is pushed in, it removes this fixed voltage from Q121's base, permitting the Clock to run. However, with C180 and C179 in parallel, the Clock will now run at approximately 2 Hz, which is the SLOW or manual stepping scan rate. Upon release of the Step switch, the Clock Inhibitor (Q121) is again forced to stop the Clock. Pushing in the Scan/Manual switch will automatically let the Clock run again at its proper scan rate.

## 1-5 470-500 MEGAHERTZ OPERATION

This unit can be retuned to cover an eight Megahertz segment of the 470-500 MHz band. The major difference is that the crystal frequency is determined by taking the channel frequency minus 10.7 MHz and dividing by ten (REFER to Section 1-2, CRYSTAL SPECIFICATIONS). This allows for L119 (injection coil for the High VHF Band) and drive coil for the UHF tripler, (Q108), not to be retuned and therefore, not affecting High VHF Band sensitivity. C139, the UHF Band injection tuning capacitor, is tuned to 10th harmonic of the crystal. Tuning procedure for 470 to 500 MHz operation is the same as in the UHF Section alignment, see Section 2-4 RF Alignment.

## SECTION 2 ALIGNMENT AND TUNING PROCEDURE

### 2-1 EQUIPMENT REQUIRED

2-1-1 FM Signal Generator
2-1-2 Oscilloscope
2-1-3 AC VTVM

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receivers should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

### 2-2 QUADRATURE DETECTOR

2-2-1 Connect the FM Signal Generator to the H/L antenna input jack. Accurately set the frequency to the center of the channel being used for alignment. Modulate Signal Generator with 1000 Hz, 3 KHz deviation.

2-2-2 Connect the oscilloscope to Junction of C162, C163 and R172.

2-2-3 Adjust Signal Generator's output until all of the noise in the scope pattern just disappears.

2-2-4 Adjust L128 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal. When L128 is properly aligned, signal at above Junction should be approximately 0.2 volts RMS with test signal input as noted in 2-2-1.

### 2-3 IF ALIGNMENT

2-3-1 Pre-Set the cores of L122, L123 and L124 9 turns in from the outer end of the coil form.

2-3-2 Connect AC voltmeter to the Junction of R167 and the collector of Q116.

2-3-3 Set AC voltmeter to the 300 millivolts scale.

2-3-4 With generator accurately set to the frequency of the center of the channel being used for alignment, increase Signal Generator's output until AC voltmeter reading is mid-range.

2-3-5 Adjust L122, L123 and L124 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to main-

tain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

## 2-4 RF ALIGNMENT

LOW BAND SECTION

2-4-1 Pre-Set the cores of L102 and L103 one turn from the outer ends of the coil form. (NOTE: Due to the broadness of the Low Band Section, presetting the above cores will give you optimum performance over the entire band).

HIGH BAND SECTION

2-4-2 Connect AC voltmeter to the Junction of R167 and the collector of Q116.

2-4-3 Set AC voltmeter to the 300 millivolts scale.

2-4-4 Activate High Band channel nearest to center of High Band frequencies being used.

2-4-5 With Signal Generator accurately set to the frequency of the center of the channel being used for alignment and connected to H/L antenna input jack, increase Signal Generator's output until AC voltmeter reading is mid-range.

2-4-6 Adjust L119, L104, L105 and L106 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output ot maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

NOTE: Adjustment to L119 of one or more turns may require UHF Section to be realigned.

UHF BAND SECTION

2-4-7 Connect AC voltmeter across the speaker terminals.

2-4-8 With Signal Generator output reduced to zero, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

2-4-9 Activate UHF channel nearest to center of UHF frequencies being used.

2-4-10 Set Signal Generator accurately to the channel being used and adjust output of Signal Generator until AC voltmeter reads .2 volts.

2-4-11 Adjust trimmers C121, C122 and C139 (in that order) for maximum quieting (lowest meter reading). Adjust the Signal Generator output to maintain voltmeter reading between .1 and .2 volts. Repeat adjustments until no further improvements can be made.

NOTE: 1) Use non-metallic screwdriver for trimmer adjustments. 2) L119 is tuned in High Band alignment. If the UHF section sensitivity is down, a readjustment to L119 may be necessary. If more than a turn one way or the other is necessary, repeat High Band alignment.

## 2-5 AFC ALIGNMENT

NOTE: This adjustment requires an accurate 10.7 MHz ±1 KHz oscillator or 455 KHz ±500 Hz oscillator to be used as a reference signal. If none are available, proceed to Step 2-5-4.

2-5-1 With a coupling loop, inject "Reference" signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R147 for reading of 3.8 to 4.0 volts at the collector of Q109.

2-5-2 Remove the "Reference" signal and have the unit squelched and receiving no signal. The voltage on the collector of Q109 shall be between 3.2 and 4.6 volts. If not, note voltage and proceed to Step 2-5-3. If voltage is between 3.2 and 4.6 volts, AFC alignment is complete.

NOTE: Any further adjustments made to L128 and R147 will require AFC to be re-adjusted.

2-5-3 Inject "Reference" signal and monitor voltage on collector of Q109. Adjust L128 for same voltage as noted in Step 3. Readjust R147 for a voltmeter reading of 3.8 to 4.0 volts. Repeat Step 2-5-2.

NOTE: Do not adjust L128 more than 1/4 turn at a time.

2-5-4 If an accurate I.F. signal source is not available, an approximate AFC alignment can be made by adjusting L128 on a High Band or Low Band crystal as specified in Quadrature Detector Alignment (Section 2-2), and with the unit squelched and receiving no signal, adjust R147 for voltmeter reading of 3.2 to 4.6 on the collector of Q109.

NOTE: Units equiped with a 10.245 MHz crystal have the jumper in the AFC circuit connected between the base of Q109 and collector of Q111. When a 11.155 MHz crystal is used, the jumper is connected between the base of Q109 and the collector of Q110. If the crystal is changed from one frequency to the other, the jumper must be changed.

# SECTION 3 DIAGRAMS, VOLTAGE DATA AND SCHEMATIC

3-1 MAIN BOARD PARTS PLACEMENT DIAGRAM

3-2 MAIN BOARD BOTTOM VIEW

3-3 MAIN BOARD JUMPER PLACEMENT (BOTTOM VIEW) DIAGRAM

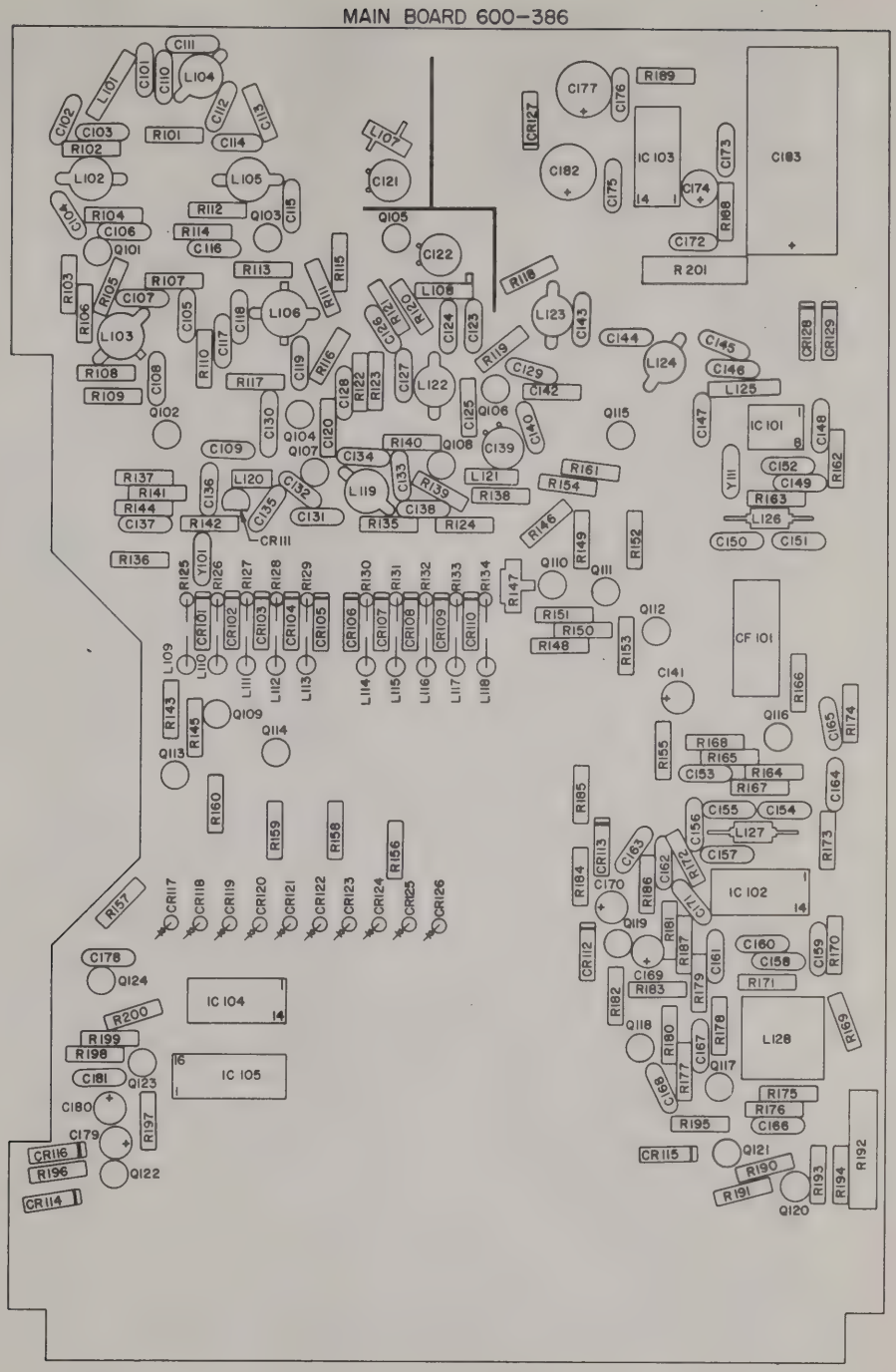
3-4 LIGHT BOARD PARTS PLACEMENT DIAGRAM

3-5 LIGHT BOARD BOTTOM VIEW

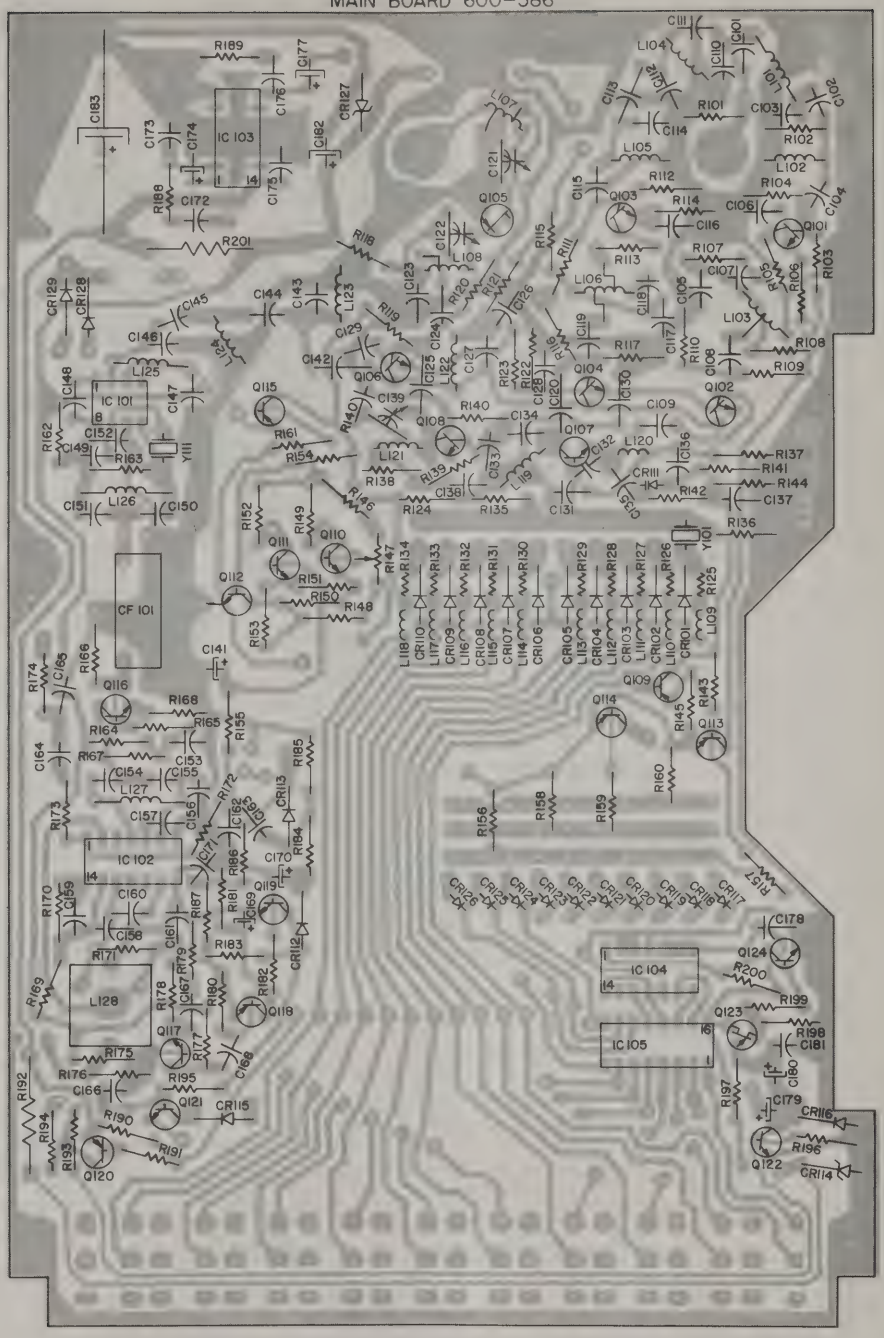
3-6 VOLTAGE DATA

3-7 CRYSTAL LOCATION DIAGRAM

3-8 SCHEMATIC

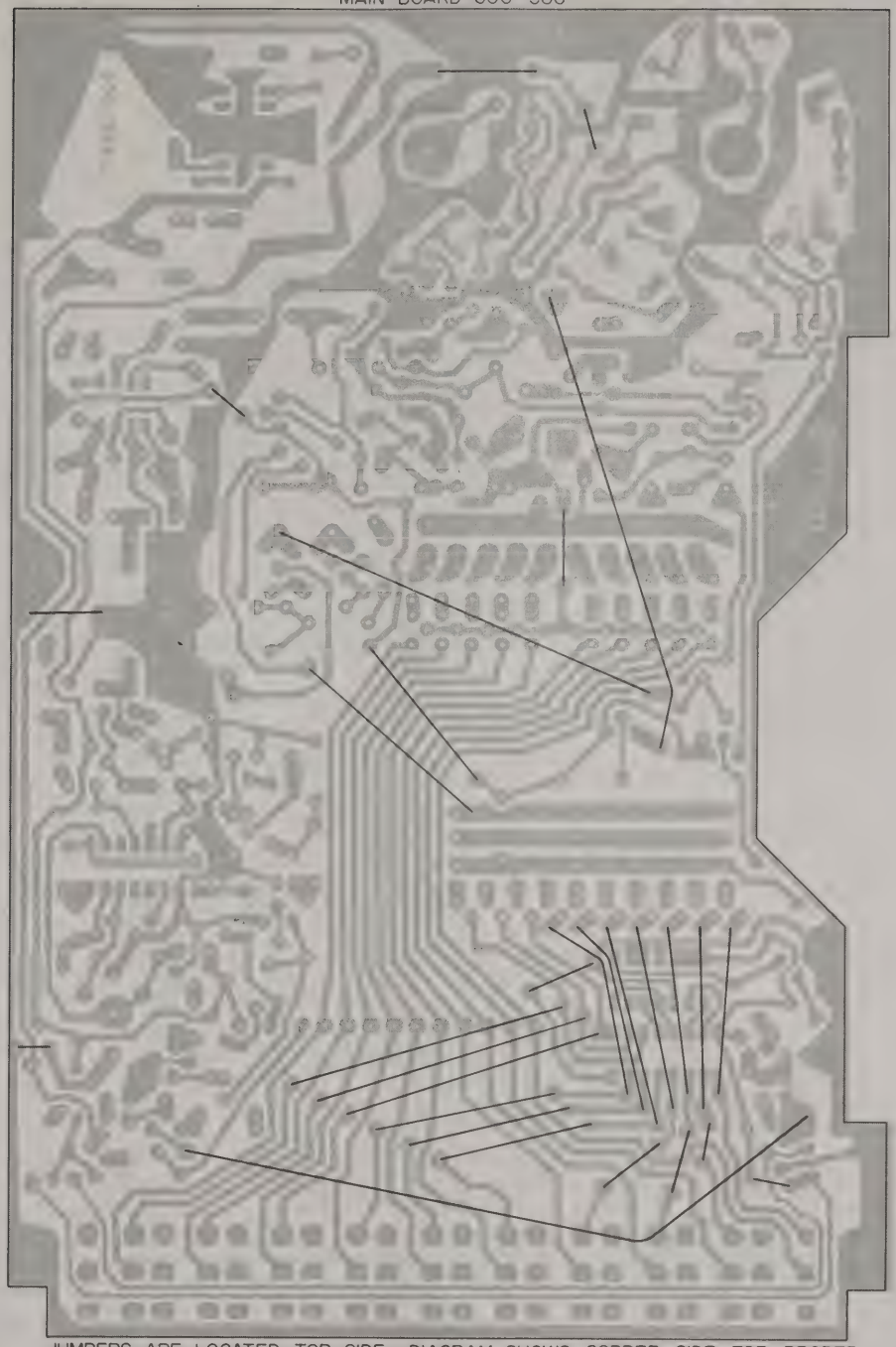



## 3-1 MAIN BOARD PARTS PLACEMENT DIAGRAM



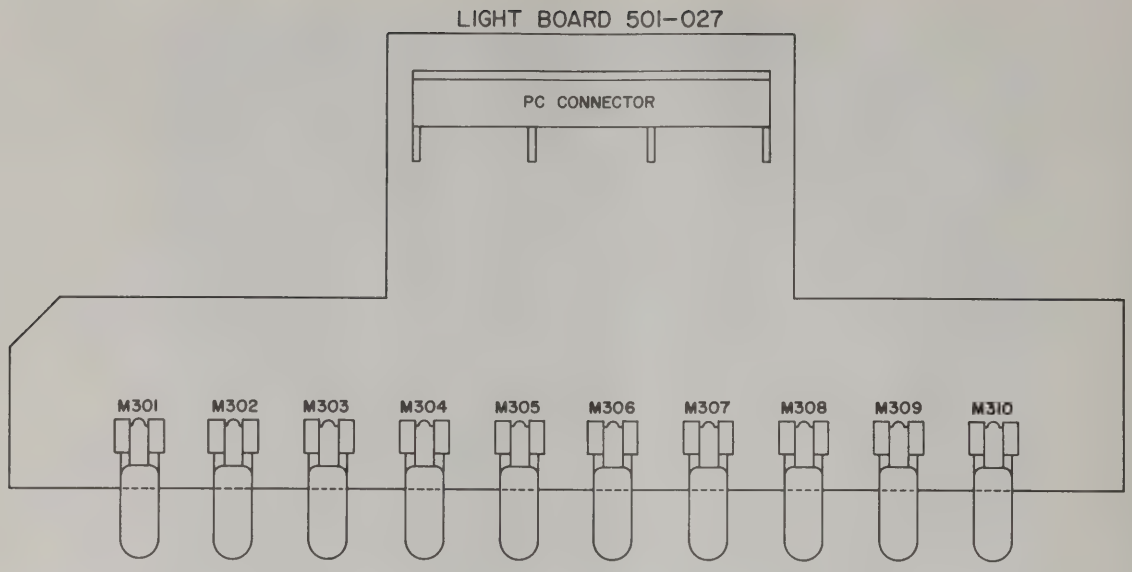

3-2 MAIN BOARD BOTTOM VIEW

MAIN BOARD 600-386

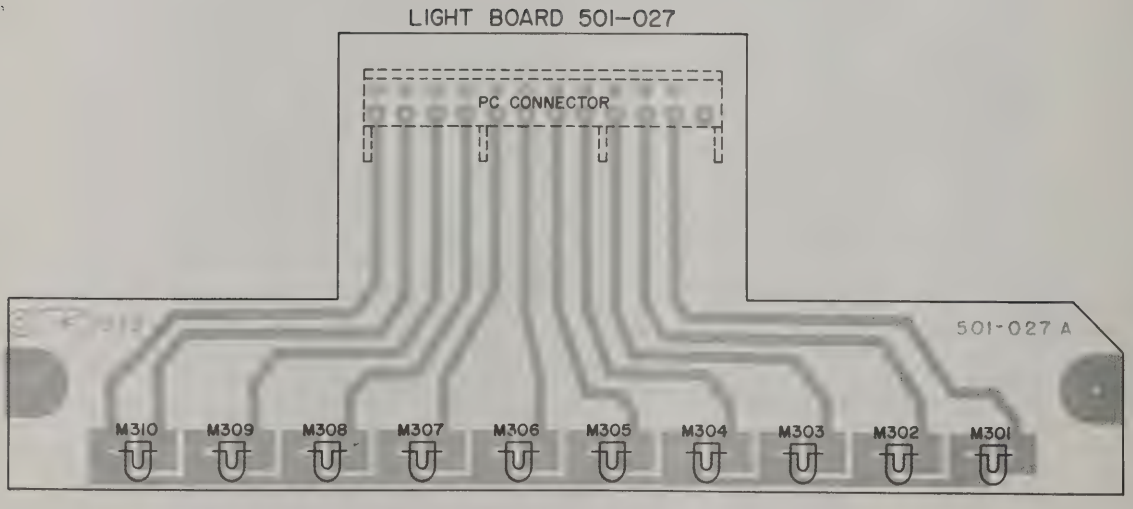


JUMPERS ARE LOCATED TOP SIDE. DIAGRAM SHOWS COPPER SIDE FOR PROPER CONNECTIONS.

## 3-3 MAIN BOARD JUMPER PLACEMENT (BOTTOM VIEW) DIAGRAM




3-4 LIGHT BOARD PARTS PLACEMENT DIAGRAM




3-5 LIGHT BOARD BOTTOM VIEW

## 3-6 VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – SEMICONDUCTORS:

| TRANSISTOR | EMITTER (Source) | BASE (Gate) | COLLECTOR (Drain) | |
|---|---|---|---|---|
| Q101 | 3.1 | 3.8 | 7.0 | Low Band Activated |
| | 0 | 0 | 0 | High Band Activated |
| | 0 | 0 | 0 | UHF Band Activated |
| Q102 | 1.6 | 2.3 | 7.7 | Low Band Activated |
| | 1.6 | 0 | 7.7 | High Band Activated |
| | 1.4 | 0 | 7.7 | UHF Band Activated |
| Q103 | 0 | 0 | 8.2 | Low Band Activated |
| | 3.1 | 3.8 | 7.9 | High Band Activated |
| | 0 | 0 | 8.2 | UHF Band Activated |
| Q104 | 1.6 | 0 | 7.7 | Low Band Activated |
| | 1.6 | 2.3 | 7.7 | High Band Activated |
| | 1.4 | 0 | 7.7 | UHF Band Activated |
| Q105 (FET) | 0 | 0 | 6.0 | |
| Q106 | 1.6 | 0 | 7.7 | Low Band Activated |
| | 1.6 | 0 | 7.7 | High Band Activated |
| | 1.6 | 2.3 | 7.7 | UHF Band Activated |
| Q107 | 3.7 | 4.4 | 7.4 | No Crystal |
| | 3.4 | 4.0 | 7.4 | With Crystal |
| Q108 | 0 | 0 | 0 | Low High Band Activated |
| | 0 | .4 | 8.1 | UHF Band Activated (No Crystal) |
| | 0 | .1 | 4.0 | UHF Band Activated (With Crystal) |
| Q109 (PNP) | 8.1 | 8.1 | .8 | Low Band Activated |
| | 8.1 | 8.1 | .8 | High Band Activated |
| | 7.9 | 7.2 | 3-5 | UHF Band Activated |
| Q110 | 8.2 | 8.2 | 8.2 | Low Band Activated |
| | 8.2 | 8.2 | 8.2 | High Band Activated |
| | 2.9 | 3.6 | 7.2 | UHF Band Activated |
| Q111 | 8.2 | 8.2 | 4.0 | Low Band Activated |
| | 8.2 | 8.2 | 4.0 | High Band Activated |
| | 2.9 | 3.6 | 7.4 | UHF Band Activated |
| Q112 | 0 | 0 | 8.2 | Low Band Activated |
| | 0 | 0 | 8.2 | High Band Activated |
| | 0 | .7 | .1 | UHF Band Activated |

## VOLTAGE DATA (CONTINUED)

| TRANSISTOR | EMITTER (Source) | BASE (Gate) | COLLECTOR (Drain) | |
|---|---|---|---|---|
| Q113 (PNP) | 8.2 | 7.5 | 8.1 | Low Band Activated |
| | 8.2 | 8.2 | 0 | High Band Activated |
| | 8.2 | 8.2 | 0 | UHF Band Activated |
| Q114 (PNP) | 8.2 | 8.2 | 0 | Low Band Activated |
| | 8.2 | 7.5 | 8.1 | High Band Activated |
| | 8.2 | 8.2 | 0 | UHF Band Activated |
| Q115 (PNP) | 8.2 | 8.2 | 0 | Low Band Activated |
| | 8.2 | 8.2 | 0 | High Band Activated |
| | 8.2 | 7.5 | 8.1 | UHF Band Activated |
| Q116 | 0.4 | 1.1 | 4.5 | |
| Q117 | 1.0 | 1.7 | 5.0 | |
| Q118 | 8.2 | 8.2 | 0 | (Unsquelched) |
| | 8.2 | 8.2 | 1.0 | (Squelched) |
| | 8.2 | 8.2 | 1.5 | Min. (Tight Squelched) |
| Q119 | 0 | 0 | 7.2 | (Unsquelched) |
| | 0 | 0.8 | 0.2 | (Squelched) |
| | 0 | 0.8 | 0.1 | (Tight Squelched) |
| Q120 | 13.8 | 13.1 | 13.6 | (SCAN) |
| | 13.8 | 13.1 | 13.6 | (MAN) |
| | 13.8 | 13.8 | 0 | (No Lights) |
| Q121 | 0 | 0 | 4.0 | (SCAN) |
| | 0 | 0.8 | 0.1 | (MAN) |
| Q122 | 0 | 0.8 | 0.1 | |
| Q124 | 0 | .2 | 4.9 | (SCAN) |
| | 0 | .2 | 5.1 | (MAN) |

| | BASE 1 | EMITTER | BASE 2 | |
|---|---|---|---|---|
| Q123 | 0.2 | 3.8 | 5.1 | (SCAN) |
| (Unijunction) | 0.2 | 0.5 | 5.1 | (MAN) |

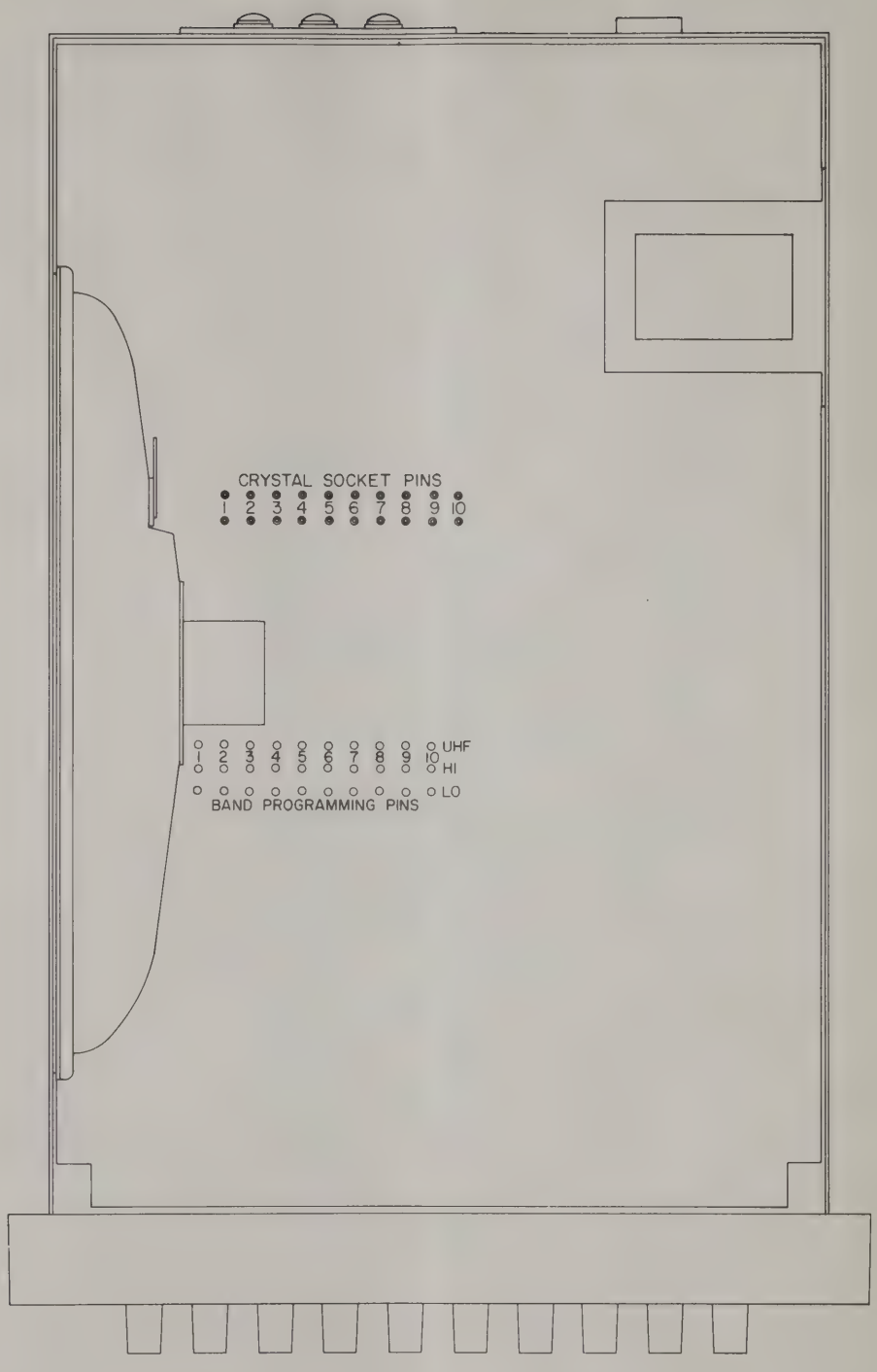
| | CATHODE | ANODE | |
|---|---|---|---|
| CR113 | 1.8 | 2.4 | (Unsquelched) |
| | 1.0 | 0 | (Squelched) |

## VOLTAGE DATA (CONTINUED)

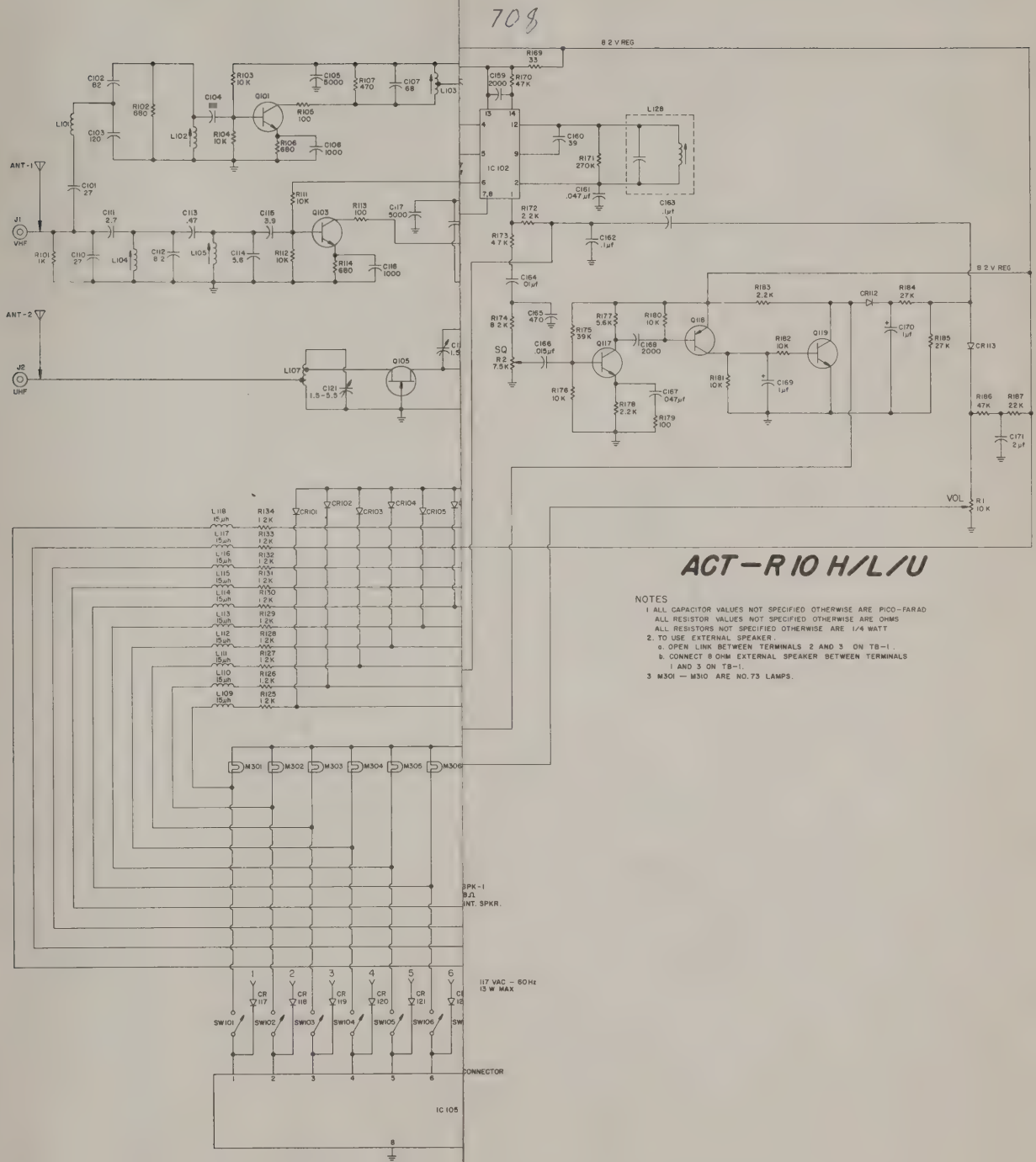
### INTEGRATED CIRCUITS

NOTE: A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M301 is lighted).

| IC No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IC 101 | 4.2 | 0.7 | 0.7 | 4.2 | 7.8 | 0 | 4.2 | 7.8 | – | – | – | – | – | – | – | – | |
| IC102 | 4.0 | 3.5 | 0 | 1.3 | 1.3 | 1.3 | 0 | 0 | 0.2 | 1.4 | 2.9 | 3.5 | 7.6 | 5.0 | – | – | |
| IC103 | 7.1 | .01 | 0 | 0 | 0 | .01 | 0 | 6.9 | 0 | 0 | 0 | 0 | 0 | 13.8 | – | – | |
| IC104 | 5.1 | 0 | 0 | 0 | 5.1 | 5.1 | 5.1 | .1 | .1 | 0 | .1 | .1. | 0 | .1 | – | – | Manual |
| | 4.9 | 0 | 0 | 0 | 5.1 | 5.1 | 5.1 | 1P | 2P | 0 | 2P | 1P | 0 | 2P | – | – | SCAN |
| IC105 | .5 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 0 | 11.2 | 11.2 | 11.2 | .1 | .1 | .1 | .1 | 5.1 | Manual |
| | 9P | 9P | 9P | 9P | 9P | 9P | 9P | 0 | 9P | 9P | 9P | 1P | 2P | 1P | 2P | 5.1 | SCAN |




**3-7 CRYSTAL LOCATION DIAGRAM**

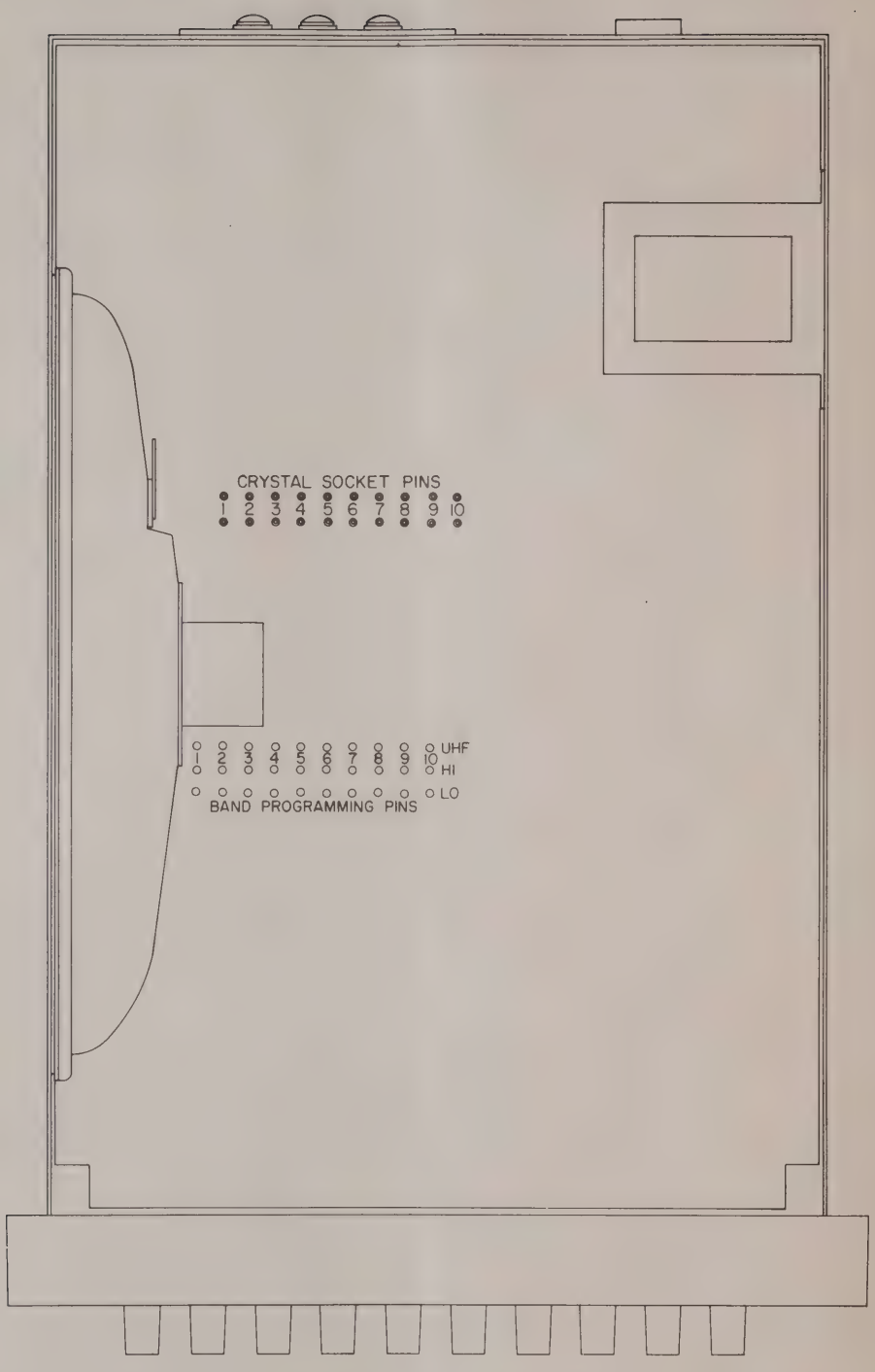



# ACT-R10 H/L/U

NOTES

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD
   ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS
   ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT
2. TO USE EXTERNAL SPEAKER:
   a. OPEN LINK BETWEEN TERMINALS 2 AND 3 ON TB-1.
   b. CONNECT 8 OHM EXTERNAL SPEAKER BETWEEN TERMINALS 1 AND 3 ON TB-1.
3. M301 – M310 ARE NO. 73 LAMPS.

## 3-8 SCHEMATIC




**3-7 CRYSTAL LOCATION DIAGRAM**

ECG-817

127A

708

# ACT-R10 H/L/U

NOTES:
1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD
   ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS
   ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT.
2. TO USE EXTERNAL SPEAKER:
   a. OPEN LINK BETWEEN TERMINALS 2 AND 3 ON TB-1.
   b. CONNECT 8 OHM EXTERNAL SPEAKER BETWEEN TERMINALS 1 AND 3 ON TB-1.
3. M301 — M310 ARE NO. 73 LAMPS.

3-8 SCHEMATIC

# SECTION 4 PARTS LIST

## 4-1 MAIN BOARD 600-386

### RESISTORS

All Resistors are ± 10%, ¼W, unless otherwise noted

| Item | Description | Part No. |
|---|---|---|
| R101 | 1K | |
| R102 | 680 ohm | |
| R103 | 10K | |
| R104 | 10K | |
| R105 | 100 ohm | |
| R106 | 680 ohm | |
| R107 | 470 ohm | |
| R108 | 68 ohm | |
| R109 | 22K | |
| R110 | 10K | |
| R111 | 10K | |
| R112 | 10K | |
| R113 | 100 ohm | |
| R114 | 680 ohm | |
| R115 | 68 ohm | |
| R116 | 22K | |
| R117 | 10K | |
| R118 | 220 ohm | |
| R119 | 22K | |
| R120 | 10K | |
| R121 | 220 ohm | |
| R122 | 680 ohm | |
| R123 | 100 ohm | |
| R124 | 68 ohm | |
| R125 | 1.2K | |
| R126 | 1.2K | |
| R127 | 1.2K | |
| R128 | 1.2K | |
| R129 | 1.2K | |
| R130 | 1.2K | |
| R131 | 1.2K | |
| R132 | 1.2K | |
| R133 | 1.2K | |
| R134 | 1.2K | |
| R135 | 10K | |
| R136 | 39K | |
| R137 | 470 ohm | |
| R138 | 1K | |
| R139 | 82K | |
| R140 | 4.7K | |
| R141 | 39K | |
| R142 | 39K | |
| R143 | 82K | |
| R144 | 10K | |
| R145 | 1K | |
| R146 | 1K | |
| R147 | 1K, Trimmer | 4751-0102-005 |
| R148 | 820 ohm | |
| R149 | 1K | |
| R150 | 3.3K | |
| R151 | 150 ohm | |
| R151 | 150 ohm | |
| R152 | 1K | |
| R153 | 3.3K | |
| R154 | 4.7K | |
| R155 | 47K | |
| R156 | 10K | |
| R157 | 4.7K | |
| R158 | 10K | |
| R159 | 4.7K | |
| R160 | 10K | |
| R161 | 4.7K | |
| R162 | 180 ohm | |
| R163 | 22K | |
| R164 | 180 ohm | |
| R165 | 12K | |
| R166 | 1.8K | |
| R167 | 1.5K | |
| R168 | 150 ohm | |
| R169 | 33 ohm | |
| R170 | 47K | |
| R171 | 270K | |
| R172 | 2.2K | |
| R173 | 4.7K | |
| R174 | 8.2K | |
| R175 | 39K | |
| R176 | 10K | |
| R177 | 5.6K | |
| R178 | 2.2K | |
| R179 | 100 ohm | |
| R180 | 10K | |
| R181 | 10K | |
| R182 | 10K | |
| R183 | 2.2K | |
| R184 | 27K | |
| R185 | 27K | |
| R186 | 47K | |
| R187 | 22K | |
| R188 | 47K | |
| R189 | 2.2 ohm | |
| R190 | 33 ohm | |
| R191 | 4.7K | |
| R192 | 82 ohm, 2W, 5% | 4707-0820-031 |
| R193 | 22K | |
| R194 | 47K | |
| R195 | 33K | |
| R196 | 4.7K | |
| R197 | 18K | |
| R198 | 220 ohm | |
| R199 | 470 ohm | |
| R200 | 2.2K | |
| R201 | 68 ohm, 2W, 5% | 4707-0680-031 |

| Item | Description | Part No. |
|---|---|---|
| | **CAPACITORS** | |
| C101 | 27pf 10%, 50V NPO (Disc.) | 1500-0270-650 |
| C102 | 82pf 5%, 50V NPO (Disc.) | 1524-0820-002 |
| C103 | 120pf 5%, 50V (Mica) | 1506-0121-550 |
| C104 | 82pf 5%, 50V NPO (Disc.) | 1524-0820-002 |
| C105 | .005mf +80%-20% 500V, Z5U (Disc.) | 1503-0502-002 |
| C106 | .001mf +80%-20% 500V, Z5U (Disc.) | 1603-0102-001 |
| C107 | 68pf 5%, 50V NPO (Disc.) | 1524-0680-002 |
| C108 | .005mf +80%-20% 500V, Z5U (Disc.) | 1503-0502-002 |
| C109 | 5.6pf 10%, 500V NPO (Disc.) | 1500-0569-905 |
| C110 | 27pf 10%, 50V NPO (Disc.) | 1500-0270-650 |
| C111 | 2.7pf 10%, 500V NPO (Disc.) | 1500-0279-905 |
| C112 | 8.2pf 10%, 500V NPO (Disc.) | 1500-0829-905 |
| C113 | .47pf 10% (Composition) | 1510-0478-900 |
| C114 | 5.6pf 10%, 500V NPO (Disc.) | 1500-0569-905 |
| C115 | 3.9pf 10%, 500V NPO (Disc.) | 1500-0399-905 |
| C116 | .001mf +80%-20% 500V, Z5U (Disc.) | 1503-0102-001 |
| C117 | .005mf +80%-20% 500V, Z5U (Disc.) | 1503-0502-002 |
| C118 | 5.6pf 10% 500V NPO (Disc.) | 1500-0569-905 |
| C119 | .005mf +80%-20% 500V, Z5U (Disc.) | 1502-0502-002 |
| C120 | 1.0pf 10% (Composition) | 1510-0010-900 |
| C121 | 1.5-5.5pf, Trimmer | 1517-0000-011 |
| C122 | 1.5-5.5pf, Trimmer | 1517-0000-011 |
| C123 | .005mf +80%-20% 500V, Z5U (Disc.) | 1503-0502-002 |
| C124 | .005mf +80%-20% 500V, Z5U (Disc.) | 1503-0502-002 |
| C125 | .47pf 10% (Composition) | 1510-0478-900 |
| C126 | .005mf +80%-20% 500V, Z5U (Disc.) | 1503-0502-002 |
| C127 | 390pf 5% 50V (Mica) | 1506-0391-550 |
| C128 | .005mf +80%-20% 500V, Z5U (Disc.) | 1503-0502-002 |
| C129 | .005mf +80%-20% 500V, Z5U (Disc.) | 1503-0502-002 |
| C130 | .01mf +80%-20% 500V, Z5U (Disc.) | 1503-0103-001 |
| C131 | .001mf +80%-20% 500V, Z5U (Disc.) | 1503-0102-001 |
| C132 | 82pf 5% 50V NPO (Disc.) | 1524-0820-002 |
| C133 | 27pf 10% 50V NPO (Disc.) | 1500-0270-650 |
| C134 | 27pf 10% 50V NPO (Disc.) | 1500-0270-650 |
| C135 | .001mf +80%-20% 500V, Z5U (Disc.) | 1503-0102-001 |
| C136 | .001mf +80%-20% 500V, Z5U (Disc.) | 1503-0102-001 |
| C137 | .2mf +80%-20% 12V (Disc.) | 1502-0204-006 |
| C138 | 150pf 20% 50V, Z5F (Disc.) | 1523-0151-002 |
| C139 | 1.5-5.5pf Trimmer | 1517-0000-011 |
| C140 | 470pf 20% 50V, Z5F (Disc.) | 1523-0471-002 |
| C141 | 1mf 85° 16V (Electrolytic) | 1513-0010-002 |
| C142 | 3.9pf 10% (Composition) | 1510-0399-900 |
| C143 | 390pf 5% 50V (Mica) | 1506-0391-550 |
| C144 | 3.9pf 10% 500V NPO (Disc.) | 1500-0399-905 |
| C145 | 680pf 5% 50V (Mica) | 1506-0681-550 |
| C146 | 390pf 5% 50V (Mica) | 1506-0391-550 |
| C147 | .01mf +80%-20% 25V (Disc.) | 1502-0103-004 |
| C148 | .01mf +80%-20% 25V (Disc.) | 1502-0103-004 |
| C149 | 68pf 5% 50V NPO (Disc.) | 1524-0680-002 |
| C150 | 180pf 5% 50V (Mica) | 1506-0181-550 |
| C151 | 390pf 5% 50V (Mica) | 1506-0391-550 |
| C152 | .2mf +80%-20% 12V (Disc.) | 1502-0204-006 |
| C153 | .2mf +80%-20% 12V (Disc.) | 1502-0204-006 |
| C154 | 270pf 5% 50V (Mica) | 1506-0271-550 |
| C155 | 250pf 5% 50V (Mica) | 1506-0251-550 |
| C156 | .2mf +80%-20% 12V (Disc.) | 1502-0204-006 |
| C157 | .2mf +80%-20% 12V (Disc.) | 1502-0204-006 |
| C158 | .2mf +80%-20% 12V (Disc.) | 1502-0204-006 |
| C159 | .002pf 20% 50V, Z5F (Disc.) | 1523-0202-002 |
| C160 | 39pf 10% 50V NPO (Disc.) | 1500-0390-650 |
| C161 | .047mf 10% 100V (Mylar film) | 1508-0473-610 |
| C162 | .1mf 20% 12V (Disc.) | 1502-0104-005 |
| C163 | .1mf 20% 12V (Disc.) | 1502-0104-005 |
| C164 | .01mf 10% 100V (Mylar film) | 1508-0103-610 |
| C165 | 470pf 20% 50V, Z5F (Disc.) | 1523-0471-002 |
| C166 | .015mf 10% 100V (Mylar film) | 1508-0153-610 |
| C167 | .047mf 10% 100V (Mylar Film) | 1508-0473-610 |
| C168 | .002pf 20% 50V, Z5F (Disc.) | 1523-0202-002 |
| C169 | 1mf 85° C 16V (Electrolytic) | 1513-0010-002 |
| C170 | 1mf 85° C 16V (Electrolytic) | 1513-0010-002 |
| C171 | .2mf +80%-20% 12V (Disc.) | 1502-0204-006 |
| C172 | .015mf 10% 100V (Mylar film) | 1508-0153-610 |
| C173 | .0033mf 10% 100V (Mylar film) | 1508-0332-610 |
| C174 | 5mf 85° C 10V (Electrolytic) | 1513-0050-001 |
| C175 | .05mf +80%-20% 25V (Disc.) | 1502-0503-004 |
| C176 | .2mf +80%-20% 12V (Disc.) | 1502-0204-006 |
| C177 | 100mf 85° C 16V (Electrolytic) | 1513-0101-002 |
| C178 | .047mf 10% 100V (Mular film) | 1508-0473-610 |
| C179 | 10mf 85° C 10V (Electrolytic) | 1513-0100-001 |
| C180 | 3.3mf 20% 85° C 10V (Electrolytic) | 1513-0339-005 |
| C181 | .015mf 10% 100V (Mylar film) | 1508-0153-610 |
| C182 | 250mf 85° C 10V (Electrolytic) | 1513-0251-001 |
| C183 | 100mf 16V (Electrolytic) | 1511-0102-002 |
| | **COILS** | |
| L101 | Choke .68 UHY | 1802-0688-003 |
| L102 | Coil, RF input (Green) | 1800-3152-005 |
| L103 | Coil, RF (Yellow) | 1800-3152-004 |
| L104 | Coil, RF input (Red) | 1800-3152-002 |
| L105 | Coil, RF input (Red) | 1800-3152-002 |
| L106 | Coil, RF (Orange) | 1800-3152-003 |
| L107 | Coil, RF 450 MHZ | 1800-3160-001 |
| L108 | Coil, RF AMP out | 1800-3160-002 |
| L109 | Choke 15 MHY | 1802-0152-004 |
| L110 | Choke 15 MHY | 1802-0152-004 |
| L111 | Choke 15 MHY | 1802-0152-004 |
| L112 | Choke 15 MHY | 1802-0152-004 |
| L113 | Choke 15 MHY | 1802-0152-004 |
| L114 | Choke 15 MHY | 1802-0152-004 |
| L115 | Choke 15 MHY | 1802-0152-004 |
| L116 | Choke 15MHY | 1802-0152-004 |
| L117 | Choke 15MHY | 1802-0152-004 |
| L118 | Choke 15MHY | 1802-0152-004 |
| L119 | Coil, RF Inj. (White) | 1800-3152-009 |
| L120 | Coil, OSC. | 1801-1236-900 |
| L121 | Coil OSC. 450 MHZ | 1800-3160-003 |
| L122 | Coil RF (White) | 1800-3191-401 |
| L123 | Coil RF (White) | 1800-3191-401 |
| L124 | Coil RF (Yellow) | 1800-3191-402 |
| L125 | Choke 6.8 uh 10% | 1802-0689-003 |
| L126 | Choke | 1802-0000-002 |

| Item | Description | Part No. |
|---|---|---|
| | **COILS (Cont'd.)** | |
| L127 | Choke | 1802-0000-002 |
| L128 | Coil, Quadrature | 1800-3151-700 |
| | **INTEGRATED CIRCUITS** | |
| IC101 | IC, 10.7 IF | 3130-3167-901 |
| IC102 | IC, 455 KHZ Detector | 3130-3157-603 |
| IC103 | IC, Audio Amplifier | 3130-3157-614 |
| IC104 | IC, Counter | 3130-3157-608 |
| IC105 | IC, Decoder Driver | 3130-3193-501 |
| | **TRANSISTORS** | |
| Q101 | Silicon NPN (RT) | 4801-0000-035 |
| Q102 | Silicon NPN (RT) | 4801-0000-035 |
| Q103 | Silicon NPN (RT) | 4801-0000-035 |
| Q104 | Silicon NPN (RT) | 4801-0000-035 |
| Q105 | Junct. FET | 4811-0000-015 |
| Q106 | Silicon NPN (RT) | 4801-0000-035 |
| Q107 | Silicon NPN, MPS5172 | 4801-0000-100 |
| Q108 | Silicon NPN (RT) | 4801-0000-035 |
| Q109 | Silicon PNP (WT) | 4801-0000-060 |
| Q110 | Silicon NPN, MPS5172 | 4801-0000-010 |
| Q111 | Silicon NPN, MPS5172 | 4801-0000-010 |
| Q112 | Silicon NPN, MPS 5172 | 4801-0000-010 |
| Q113 | Silicon PNP (WT) | 4801-0000-060 |
| Q114 | Silicon PNP (WT) | 4801-0000-060 |
| Q115 | Silicon PNP (WT) | 4801-0000-060 |
| Q116 | Silicon NPN, MPS 5172 | 4801-0000-060 |
| Q117 | Silicon NPN, MPS 5172 | 4801-0000-010 |
| Q118 | Silicon PNP (WT) | 4801-0000-060 |
| Q119 | Silicon NPN, MPS 5172 | 4801-0000-010 |
| Q120 | Silicon PNP (WT) | 4801-0000-060 |
| Q121 | Silicon NPN, MPS 5172 | 4801-0000-010 |
| Q122 | Silicon NPN, MPS 5172 | 4801-0000-010 |
| Q123 | PN Silicon, Unijunction | 4813-0000-001 |
| Q124 | Silicon NPN, MPS 5172 | 4801-0000-010 |
| | (WT) = White Top (RT) = Red Top | |
| | **DIODES** | |
| CR101 | Germanium-junction, signal | 4807-1233-900 |
| CR102 | Germanium-junction, signal | 4807-1233-900 |
| CR103 | Germanium-junction, signal | 4807-1233-900 |
| CR104 | Germanium-junction, signal | 4807-1233-900 |
| CR105 | Germanium-junction, signal | 4807-1233-900 |
| CR106 | Germanium-junction, signal | 4807-1233-900 |
| CR107 | Germanium-junction, signal | 4807-1233-900 |
| CR108 | Germanium-junction, signal | 4807-1233-900 |
| CR109 | Germanium-junction, signal | 4807-1233-900 |
| CR110 | Germanium-junction, signal | 4807-1233-900 |
| CR111 | VARICAP | 4809-0000-001 |
| CR112 | Silicon, IN4148 | 4805-1241-200 |
| CR113 | Silicon, IN4148 | 4805-1241-200 |
| CR114 | Zener 5% 5.1V | 4808-0000-007 |
| CR115 | Silicon, IN4148 | 4805-1241-200 |
| CR116 | Silicon, IN4148 | 4805-1241-200 |
| CR117 | Silicon, IN4148 | 4805-1241-200 |

| Item | Description | Part No. |
|---|---|---|
| CR118 | Silicon, IN4148 | 4805-1241-200 |
| CR119 | Silicon, IN4148 | 4805-1241-200 |
| CR120 | Silicon, IN4148 | 4805-1241-200 |
| CR121 | Silicon, IN4148 | 4805-1241-200 |
| CR122 | Silicon, IN4148 | 4805-1241-200 |
| CR123 | Silicon, IN4148 | 4805-1241-200 |
| CR124 | Silicon, IN4148 | 4805-1241-200 |
| CR125 | Silicon, IN4148 | 4805-1241-200 |
| CR126 | Silicon, IN4148 | 4805-1241-200 |
| CR127 | Zener 8.2V | 4808-0000-009 |
| CR128 | Silicon Rectifier | 4806-0000-004 |
| CR129 | Silicon Rectifier | 4806-0000-004 |
| | **FILTER** | |
| CF101 | Ceramic | 2700-0000-007 |
| | **CRYSTAL** | |
| Y111 | 10.245 MHZ | 2301-3151-601 |
| | **MISCELLANEOUS** | |
| SW101- | Switch (10POS) | 5112-5038-401 |
| SW110 | Shield Assembly (301-602 | 2508-1256-300 |
| | | 2508-1256-400 |

## 4-2 LIGHT BOARD 501-027

| Item | Description | Part No. |
|---|---|---|
| | **LAMPS** | |
| M301-M310 | Lamp, incandescent, 14.4V, 80MA (WB # 73) | 3901-0000-007 |
| | **MECHANICAL** | |
| | Bulb Cup | 2830-1276-900 |
| | Connector (12PIN) | 2105-0000-012 |

## 4-3 CHASSIS ASSEMBLY

| Item | Description | Part No. |
|---|---|---|
| | **ELECTRICAL COMPONENTS** | |
| R1 | Res. Var. 10K/SW | 4750-3212-101 |
| R2 | Res. Var. 7.5K | 4750-3212-102 |
| R3 | Res. Comp. 1MEG., 10%, ½W | 4701-0105-044 |
| C1 | .005MF, +80-20%, 1.4KV Z5U (Disc.) | 1501-0502-002 |
| SPK-1 | Speaker 2 x 6 in. 8 ohm | 1301-5101-000 |
| ANT-1 | Antenna, H/L Telescoping | 1201-0000-002 |
| ANT-2 | Antenna, UHF Telescoping | 1201-0000-003 |
| T1 | Power Transformer | 5604-5100-600 |
| J1, J2 | Antenna Connector | 2105-0000-005 |
| P1 | AC Connector | 2105-1279-100 |
| P2 | DC Connector | 2105-1277-900 |
| Y100 | Crystal, Receive (Low Band) | 2303-0000-000 |
| Y100 | Crystal, Receive (Highband) | 2302-0000-000 |
| Y100 | Crystal, Receive (450-470MHZ) | 2304-0000-000 |
| Y100 | Crystal, Receive (470-500MHZ) | 2320-0000-000 |
| MA-16 | AC Power Cord | 6041-3215-900 |
| MA-17 | DC Power Cord Assembly | 7011-1047-800 |
| SW1-2 | Switch | 5112-6035-820 |
| | **MECHANICAL COMPONENTS** | |
| | AC Shield | 2508-3215-800 |
| | Speaker, MTG. Speed Nut | 2853-0000-003 |
| TB-1 | Terminal Board (3Lug) | 2103-3007-907 |
| | Front Panel (Bezel) | 1405-6034-302 |
| | Face Plate | 2403-3212-600 |
| | Knob, Volume & Squelch | 2402-1276-202 |
| | Lens, 10 Station | 3900-5100-800 |
| | Cabinet/Wrap Assembly | 1408-6038-500 |
| | Bushing, Mounting Bolt | 2501-3214-000 |
| | Bushing, UHF Antenna | 2501-0000-006 |
| | Bushing, H/L Antenna | 2501-0000-007 |
| | Feet, Rubber | 1402-0000-001 |
| | Mounting Bolt (¼-20 x 5/8 | 2806-0625-002 |
| | Bracket, Mobile, Mounting | 1400-3214-200 |
| | Manual, Owner's Instruciton | 7001-1047-500 |
| | Manual, Service ($5.00 Prepaid) | |

# SECTION 5 SERVICE MANUAL ADDENDUM

## ADDENDUM CONTENTS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5-2 Crystal Installation
5-3 Special Note on AFC Operation
5-4 Alignment and Tuning Procedure

- 5-4-1 Equipment Required
- 5-4-2 Quadrature Detector
- 5-4-3 IF Alignment
- 5-4-4 RF Alignment
- 5-4-5 AFC Alignment

5-5 DIAGRAMS, VOLTAGE DATA AND SCHEMATIC

- 5-5-1 Main Board Parts Placement Diagram
- 5-5-2 Main Board Bottom View
- 5-5-3 Main Board Jumper Diagram Bottom View
- 5-5-4 Voltage Data
- 5-5-5 Crystal Location Diagram
- 5-5-6 Schematic

5-6 PARTS LIST

- 5-6-1 Main Board 700-164


Contains Information on Main Printed Circuit Board 700-164.

## 5 - 1 CIRCUIT CHANGES (DESCRIPTION)

Changes made in the ACT-R 10 H/L/U started with serial #85-07500. Another 1st oscillator has been added to the unit. Now there is a separate oscillator for the High and Low Band crystals and one for the UHF crystals. The first L.O. (local oscillator, Q125, uses third overtone crystals and operates on all VHF channels, whether High or Low Band. For Low Band signals, the fundamental frequency of the crystal is taken off the Emitter of Q125 for injection. For High VHF Band signals, the third harmonic of the crystal is coupled off the collector of Q125 for oscillator injection. For UHF Band signals, the third harmonic of the crystal is coupled off the collector circuitry of Q107 (the first L.O. for UHF) and is coupled to the base of Q108. Q108 is a tripler which multiplies the 3rd harmonic of the UHF oscillator (Q107) by three for use as the ultimate injection frequency. Instead of two rows of crystal pins, there are now three rows of crystal socket pins. The middle or center row is common to the diode switching circuitry (CR-101-110, R125-134, L109-118), thus one pin or lead of the crystal is always inserted in the center row. The other crystal lead is inserted in the associated socket in one of the two outer rows, depending upon whether it is a VHF or UHF crystal. This connects the crystal to its appropriate oscillator.

## 5 - 2 CRYSTAL INSTALLATION

Due to the numerous frequencies involved, the crystal is not normally installed by the factory, but by the seller or owner of the unit. Miniature, plug-in crystals are installed by inserting them in receptacles mounted on the printed circuit board.

Prior to installing a crystal, the receiver's cover will have to be removed. To remove the cover, first remove telescopic antennas if they are installed. Second, unscrew the two large bolts located at the sides of the unit. The cover may then be slipped off by sliding it toward the rear of the unit.

Carefully install the crystal in the proper pair of socket pins as indicated in the Crystal Location Drawing 5-5-5. The crystal MUST be installed in the proper row for correct operation. The numbers located between two of the rows of pins indicate which group of pins correspond to the channel number on the front panel.

If the crystal is for the UHF band (450 to 500 MHz), it should be installed with one lead in a center row pin (labeled COMMON) and its other lead in the corresponding pin in the row labeled UHF (row of pins near the rear of unit). If the crystal is for one of the VHF bands (either High or Low), it should be installed with one lead in a center row pin and its other lead in the corresponding pin in the row labeled VHF (row of pins near the fron of unit). Thus, one of the crystal's leads must always be inserted in a center row socket pin while its other lead is inserted in the proper corresponding outer row socket pin.

Band programming and crystal specifications are the same as stated in the original ACT-R 10 Service and Instruction Manual.

## 5 - 3 SPECIAL NOTE ON AFC OPERATION

The second L.O. frequency is normally 10.245 MHz. In cases where interference is encountered from a signal approximately 910 KHz below the desired frequency, the second L.O. may be changed to 11.155 MHz. If the second L.O. is 10.245 MHz, the error voltage is taken from the collector of Q111. If the second L.O. has been changed to 11.155 MHz, the error voltage is taken from the collector of Q110. Also, if the 450 MHz RF crystals are changed to high side injection and the IF crystal is still 10.245 MHz, the error voltage is taken from the collector of Q110.

## 5 - 4 ALIGNMENT AND TUNING PROCEDURE

### 5 - 4-1 EQUIPMENT REQUIRED

5-4-1-1 FM Signal Generator
5-4-1-2 Oscilloscope
5-4-1-3 AC VTVM

NOTE: During all steps of alignment, the squelch control should be in the maximum clockwise position (minimum squelch action).

All receiver RF sections (Low, High and UHF) should be aligned to the channel nearest the center of the frequency range in the band over which they will operate.

### 5 - 4-2 QUADRATURE DETECTOR

5-4-2-1 Connect the FM Signal Generator to the H/L antenna input jack. Accurately set the frequency to the center of the channel being used for alignment. Modulate Signal Generator with 1000 Hz, 3 KHz deviation.

5-4-2-2 Connect the oscilloscope to Junction of C162, C163 and R172.

5-4-2-3 Adjust Signal Generator's output until all of the noise in the scope pattern just disappears.

5-4-2-4 Adjust L128 for maximum peak to peak amplitude, while maintaining symmetry of the detected signal. When L128 is properly aligned, signal at above Junction should be approximately 0.2 volts RMS with test signal input as noted in 5-4-2-1.

### 5 - 4-3 IF ALIGNMENT

5-4-3-1 Pre-Set the cores of L122, L123 and L124 9 turns in from the outer end of the coil form. This step is usually necessary only if the IF appears to be badly misaligned.

5-4-3-2 Connect AC voltmeter to the Junction of R 167 and the collector of Q116.

5-4-3-3 Set AC voltmeter to the 300 millivolts scale.

5-4-3-4 With generator accurately set to the frequency of the center of the channel being used for alignment, increase Signal Generator's output until AC voltmeter reading is mid-range.

5-4-3-5 Adjust L122, L123, and L124 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

**5-4-4 RF ALIGNMENT**

LOW BAND SECTION

5-4-4-1 Pre-Set the cores of L102 and L103 one turn from the outer ends of the coil form. (NOTE: Due to the broadness of the Low Band Section, presetting the above cores will give you optimum performance over the entire band).

HIGH BAND SECTION

5-4-4-2 Connect AC voltmeter to the Junction of R 167 and the collector of Q116.

5-4-4-3 Set AC voltmeter to the 300 millivolts scale.

5-4-4-4 Activate High Band channel nearest to center of High Band frequencies being used.

5-4-4-5 With the Signal Generator accurately set to the frequency of the channel being used for alignment and connected to H/L antenna input jack, increase Signal Generator's output until AC voltmeter reading is mid-range.

5-4-4-6 Adjust L109, L104, L105 and L106 (in that order) for maximum AC voltmeter reading. Readjust Signal Generator's output to maintain voltmeter reading approximately in the mid-range. Repeat adjustment until no further improvements can be made.

UHF BAND SECTION

5-4-4-7 Connect AC voltmeter across the speaker terminals.

5-4-4-8 With Signal Generator output reduced to zero, adjust the volume control until AC voltmeter reads 1.0 volt of noise.

5-4-4-9 Activate UHF channel nearest to center of UHF frequencies being used.

5-4-4-10 Set Signal Generator accurately to the channel being used and adjust output of Signal Generator until AC voltmeter reads .2 volts.

5-4-4-11 Pre-Set trimmer capacitor C139 for minimum capacitance. The movable half-moon section (gold color) should be turned toward the right side of the unit, as viewed from the front.

5-4-4-12 Adjust trimmer capacitor C121 and C122 (in that order) for maximum quieting (lowest meter reading). Adjust Signal Generator output to maintain a voltmeter reading between 0.1 and 0.2 volts. Repeat adjustments until no further improvement can be made.

NOTE: Use a non-metallic tool for all trimmer capacitor adjustments. Peaks are very sharp, so tune with care.

5-4-4-13 Adjust the core of L119 for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a reading between 0.1 and 0.2 volts.

5-4-4-14 Adjust trimmer capacitor C139 for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a reading between 0.1 and 0.2 volts.

5-4-4-15 Readjust trimmer capacitors C121, C122 and C139 (in that order) for maximum quieting (lowest meter reading). Adjust Signal Generator's output to maintain a voltmeter reading between 0.1 and 0.2 volts. Repeat these adjustments until no further improvement can be made.

## 5-4-5 AFC ALIGNMENT

NOTE: This adjustment requires an accurate 10.7 MHz ±1 KHz oscillator or 455 KHz ±500 Hz oscillator to be used as a reference signal. If none are available, proceed to Step 5-4-5-4.

5-4-5-1 With a coupling loop, inject "Reference" Signal (either 10.7 MHz or 455 KHz) to produce good quieting (more than 30 DB quieting). Adjust R147 for reading of 3.8 to 4.0 volts at the collector of Q109.

5-4-5-2 Remove the "Reference" Signal and have the unit squelched and receiving no signal. The voltage on the collector of Q109 shall be between 3.2 and 4.6 volts. If not, note voltage and proceed to Step 5-4-5-3. If voltage is between 3.2 and 4.6 volts, AFC alignment is complete.

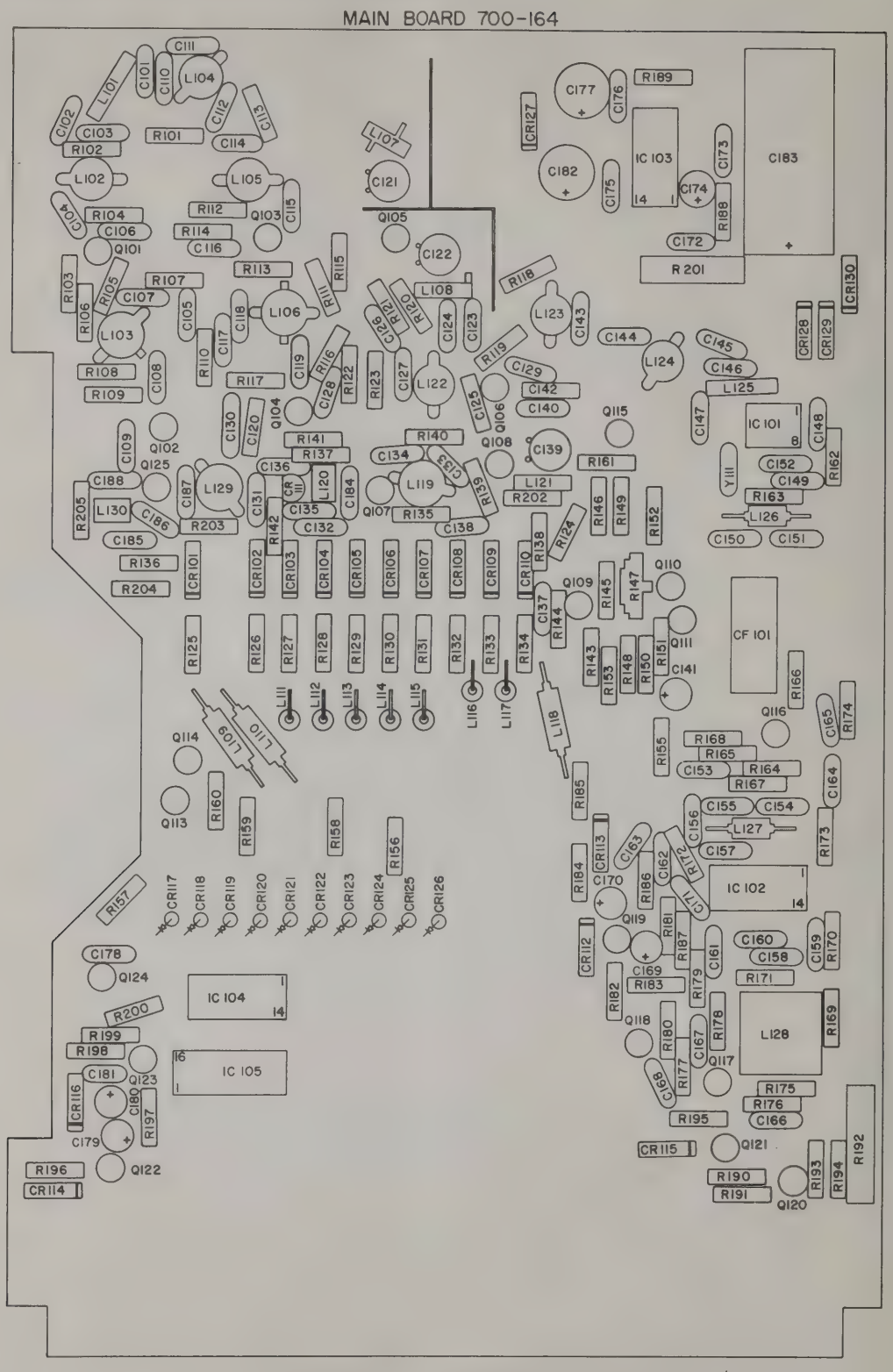
NOTE: Any further adjustments made to L128 and R147 will require AFC to be re-adjusted.

5-4-5-3 Inject "Reference" Signal and monitor voltage on collector of Q109. Adjust L128 for same voltage as noted in step 5-4-5-2. Readjust R147 for a voltmeter reading of 3.8 to 4.0 volts. Repeat step 5-4-5-2.

NOTE: Do Not adjust L128 more than 1/4 turn at a time.

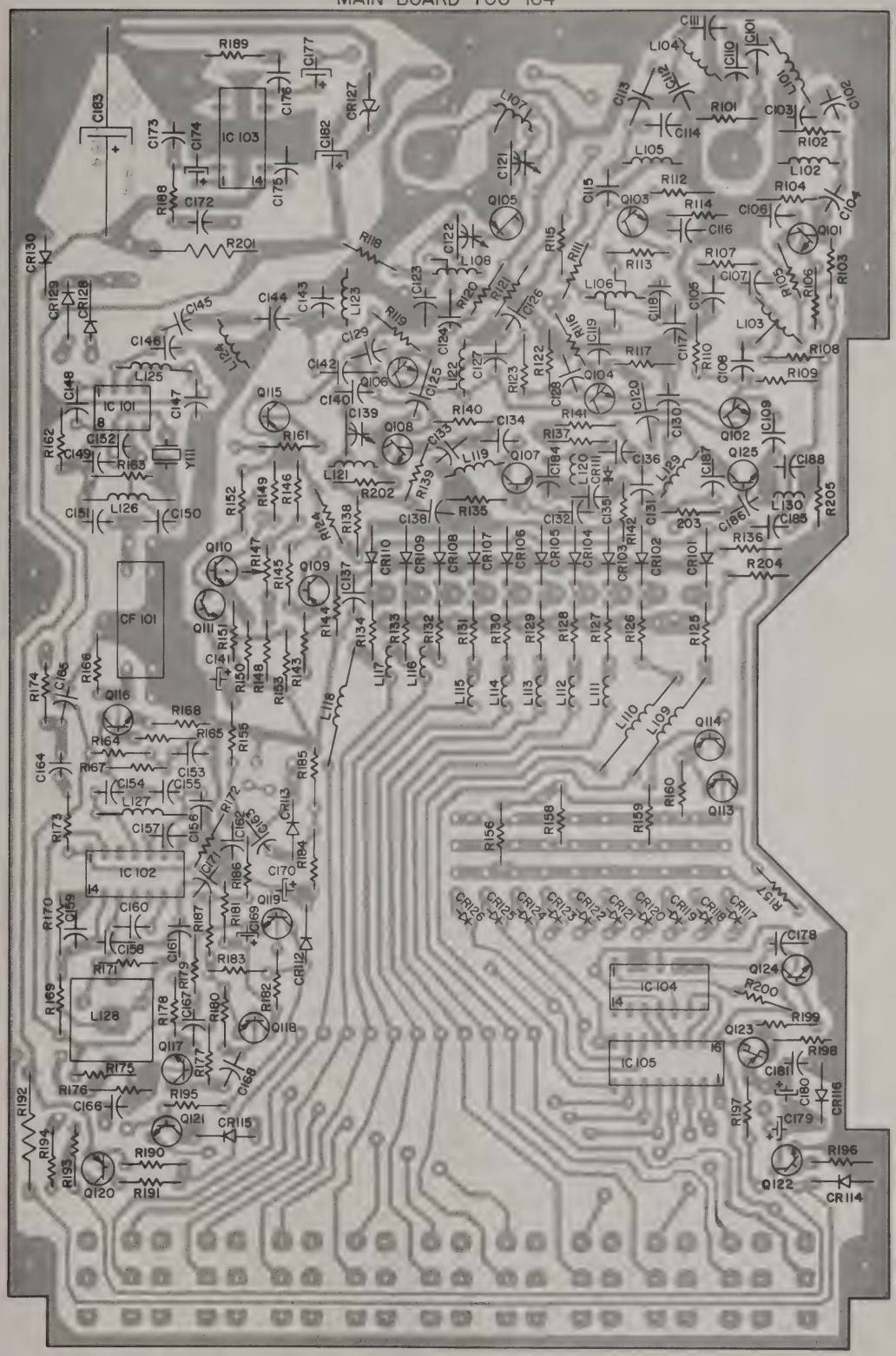
5-4-5-4 If an accurate I.F. signal source is not available, an appropriate AFC alignment can be made by adjusting L128 on a High Band or Low Band crystal as specified in Quadrature Detector Alignment (Section 5-4-2, and with the unit squelched and receiving no signal, adjust R147 for voltmeter reading of 3.2 to 4.6 on the collector of Q109.

NOTE: Units equipped with a 10.245 MHz crystal have the jumper in the AFC circuit connected between the base of Q109 and collector of Q111. When a 11.155 MHz crystal is used, the jumper is connected between the base of Q109 and the collector of Q110. If the crystal is changed from one frequency to the other, the jumper must be also changed. If the UHF first L.O. crystals are made for high side injection (to eliminate a primary image problem in certain areas of the country), the jumper must be changed.



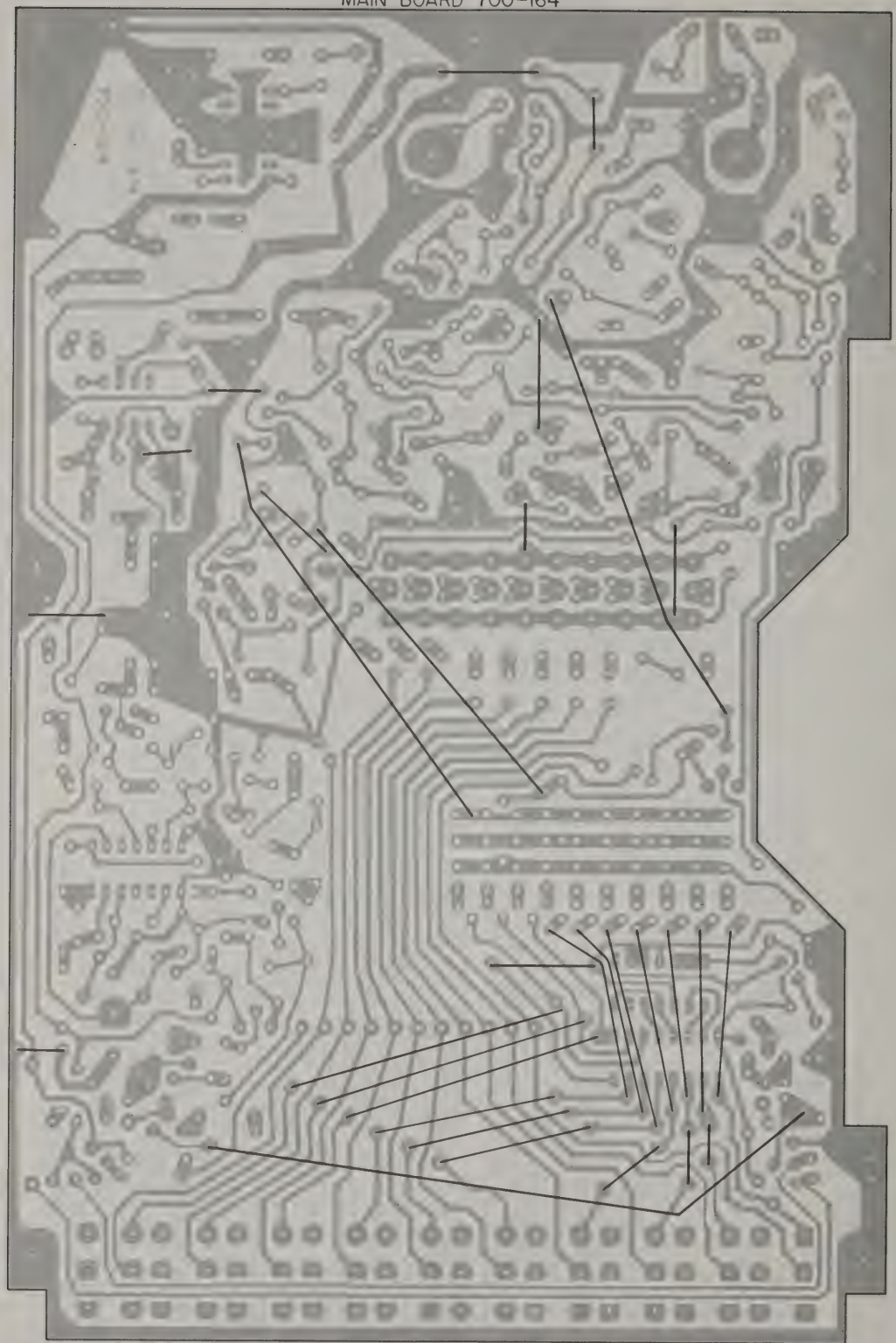

5 - 5-1 MAIN BOARD PLACEMENT DIAGRAM 700 - 164

MAIN BOARD 700-164



5 - 5-2 MAIN BOARD BOTTOM VIEW 700 - 164

MAIN BOARD 700-164



JUMPERS ARE LOCATED TOP SIDE. DIAGRAM SHOWS COPPER SIDE FOR PROPER CONNECTIONS.

**5 - 5-3 MAIN BOARD JUMPER DIAGRAM BOTTOM VIEW**

## 5 - 5-4 VOLTAGE DATA

NOTE: All voltages are nominal and are measured with a VTVM. SCAN indicates the unit is scanning. MAN indicates the unit is not scanning and is stopped at channel 1. A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating.

VOLTAGE DATA – SEMICONDUCTORS

| TRANSISTOR | EMITTER (Source) | BASE (Gate) | COLLECTOR (Drain) | |
|---|---|---|---|---|
| Q101 | 3.1 | 3.8 | 7.0 | Low Band Activated |
| | 0 | 0 | 0 | High Band Activated |
| | 0 | 0 | 0 | UHF Band Activated |
| Q102 | 1.6 | 2.3 | 7.7 | Low Band Activated |
| | 1.6 | 0 | 7.7 | High Band Activated |
| | 1.4 | 0 | 7.7 | UHF Band Activated |
| Q103 | 0 | 0 | 8.2 | Low Band Activated |
| | 3.1 | 3.8 | 7.9 | High Band Activated |
| | 0 | 0 | 8.2 | UHF Band Activated |
| Q104 | 1.6 | 0 | 7.7 | Low Band Activated |
| | 1.6 | 2.3 | 7.7 | High Band Activated |
| | 1.4 | 0 | 7.7 | UHF Band Activated |
| Q105 (FET) | 0 | 0 | 6.0 | |
| Q106 | 1.6 | 0 | 7.7 | Low Band Activated |
| | 1.6 | 0 | 7.7 | High Band Activated |
| | 1.6 | 2.3 | 7.7 | UHF Band Activated |
| Q107 | 3.7 | 4.4 | 7.3 | No Crystal |
| | 3.4 | 4.0 | 7.3 | With Crystal |
| Q108 | 0 | .4 | 7.3 | UHF Band (No Crystal) |
| | 0 | .1 | 4.0 | UHF Band (With Crystal) |
| Q109 (PNP) | 7.9 | 7.2 | 3-5 | |
| Q110 | 2.9 | 3.6 | 7.2 | |
| Q111 | 2.9 | 3.6 | 7.4 | |
| Q113 (PNP) | 8.2 | 7.5 | 8.1 | Low Band Activated |
| | 8.2 | 8.2 | 0 | High Band Activated |
| | 8.2 | 8.2 | 0 | UHF Band Activated |
| Q114 (PNP) | 8.2 | 8.2 | 0 | Low Band Activated |
| | 8.2 | 7.5 | 8.1 | High Band Activated |
| | 8.2 | 8.2 | 0 | UHF Band Activated |
| Q115 (PNP) | 8.2 | 8.2 | 0 | Low Band Activated |
| | 8.2 | 8.2 | 0 | High Band Activated |
| | 8.2 | 7.5 | 8.1 | UHF Band Activated |
| Q116 | 0.4 | 1.1 | 4.5 | |

| TRANSISTOR | EMITTER (Source) | BASE (Gate) | COLLECTOR (Drain) | |
|---|---|---|---|---|
| Q117 | 1.0 | 1.7 | 5.0 | |
| Q118 | 8.2 | 8.2 | 0 | (Unsquelched) |
| | 8.2 | 8.2 | 1.0 | (Squelched) |
| | 8.2 | 8.2 | 1.5 | Min. (Tight Squelched) |
| Q119 | 0 | 0 | 7.2 | (Unsquelched) |
| | 0 | 0.8 | 0.2 | (Squelched) |
| | 0 | 0.8 | 0.1 | (Tight Squelched) |
| Q120 | 13.8 | 13.1 | 13.6 | (SCAN) |
| | 13.8 | 13.1 | 13.6 | (MAN) |
| | 13.8 | 13.8 | 0 | (No Lights) |
| Q121 | 0 | 0 | 4.0 | (SCAN) |
| | 0 | 0.8 | 0.1 | (MAN) |
| Q122 | 0 | 0.8 | 0.1 | |
| Q124 | 0 | .2 | 4.9 | (SCAN) |
| | 0 | .2 | 5.1 | (MAN) |
| Q125 | 3.7 | 4.4 | 7.3 | No Crystal |
| | 3.4 | 4.0 | 7.3 | With Crystal |

| | BASE 1 | EMITTER | BASE 2 | |
|---|---|---|---|---|
| Q123 | 0.2 | 3.8 | 5.1 | (SCAN) |
| Unijunction | o.2 | 0.5 | 5.1 | (MAN) |

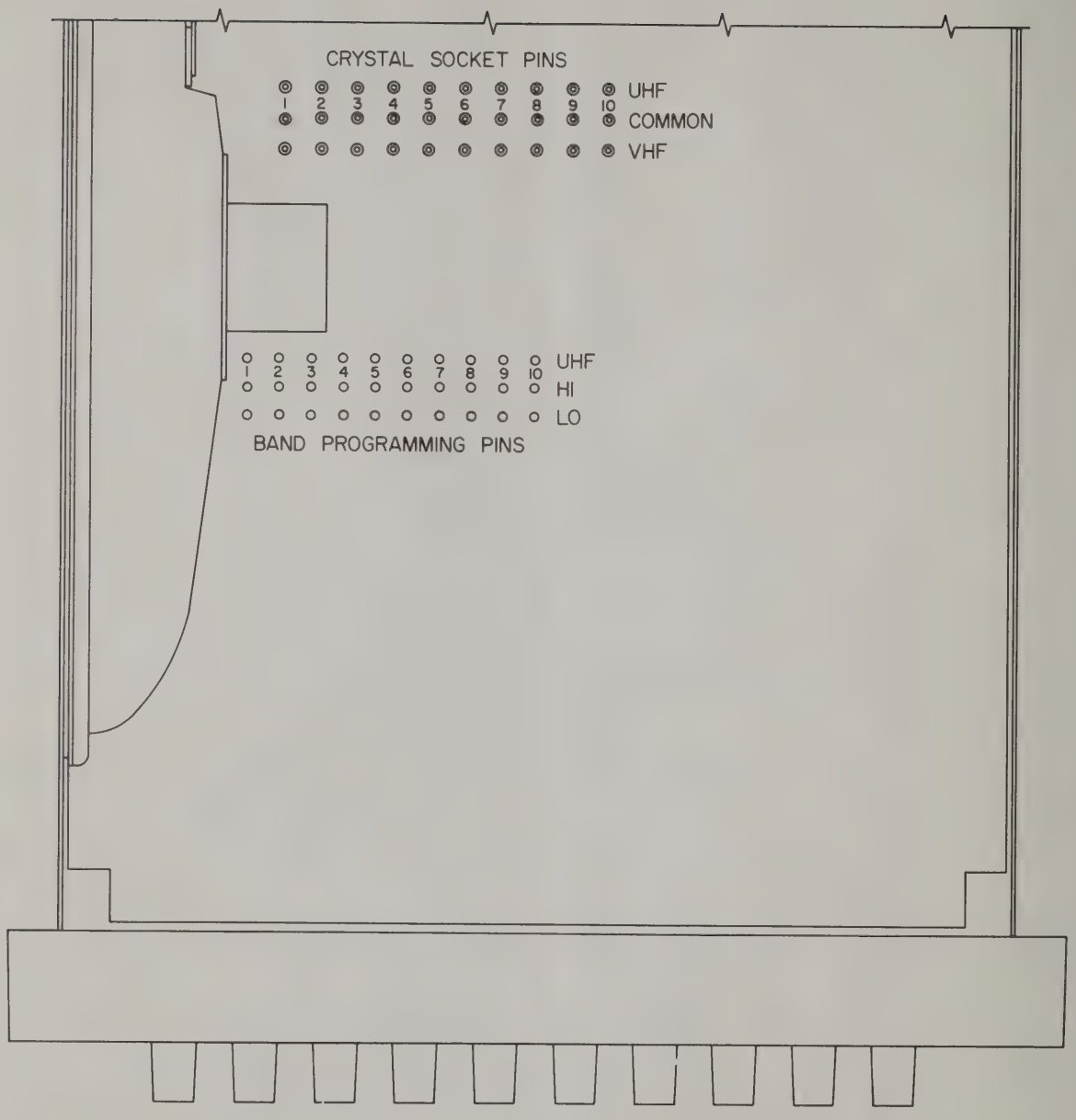
| | CATHODE | ANODE | |
|---|---|---|---|
| CR113 | 1.8 | 2.4 | (Unsquelched) |
| | 1.0 | 0 | (Squelched) |

## VOLTAGE DATA

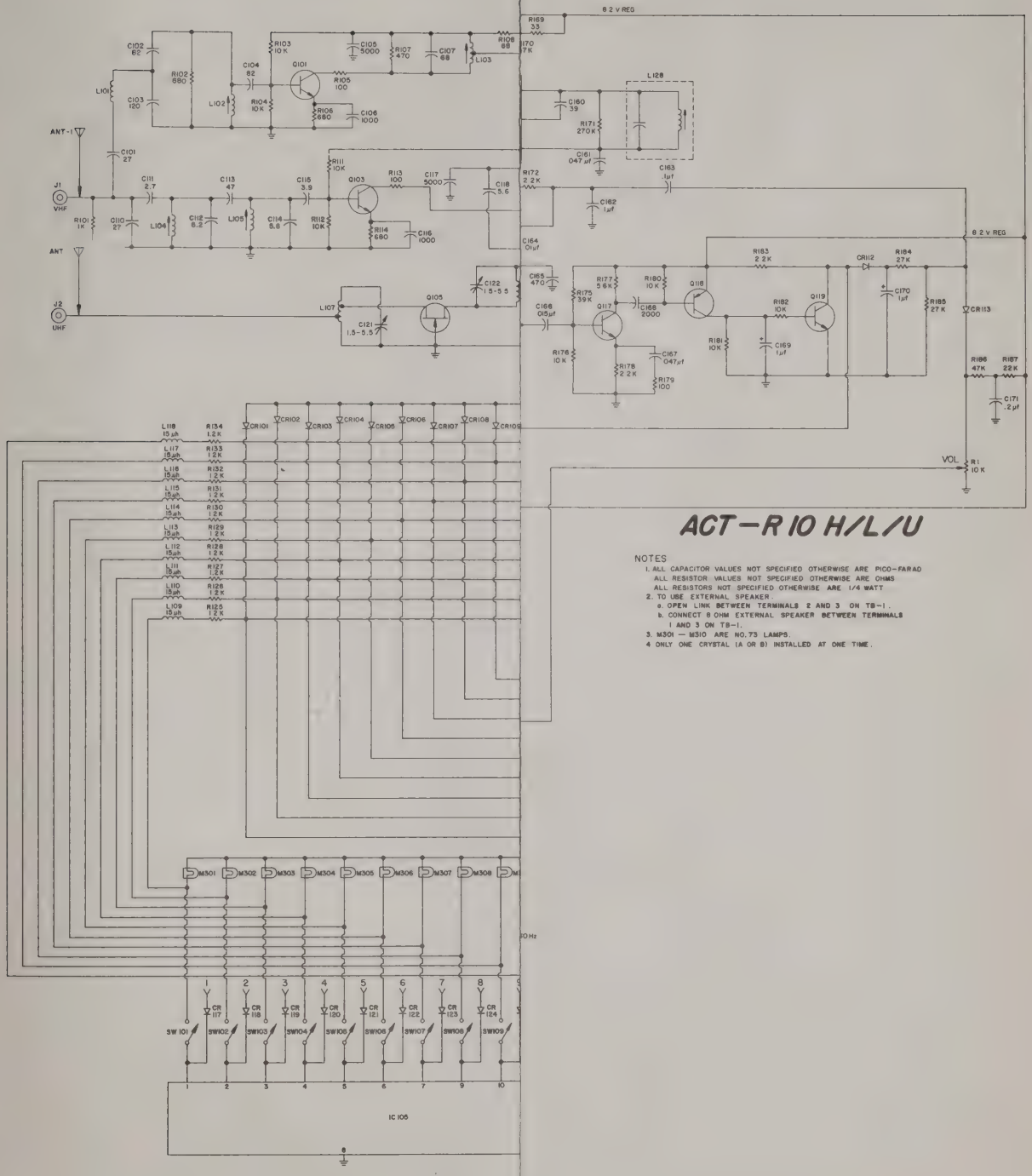
### INTEGRATED CIRCUITS

NOTE: A "P" beside a voltage indicates that the meter reading is pulsating (fluctuating) because the scanner section of the unit is operating. MAN indicates the unit is not scanning and is at channel 1 (M301 is lighted).

| IC No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| IC101 | 4.2 | 0.7 | 0.7 | 4.2 | 7.8 | 0 | 4.2 | 7.8 | – | – | – | – | – | – | – | – | |
| IC102 | 4.0 | 3.5 | 0 | 1.3 | 1.3 | 1.3 | 0 | 0 | 0.2 | 1.4 | 2.9 | 3.5 | 7.6 | 5.0 | – | – | |
| IC103 | 7.1 | .01 | 0 | 0 | 0 | .01 | 0 | 6.9 | 0 | 0 | 0 | 0 | 0 | 13.8 | – | – | |
| IC104 | 5.1 | 0 | 0 | 0 | 5.1 | 5.1 | 5.1 | .1 | .1 | 0 | .1 | .1 | 0 | .1 | – | – | Manual |
| | 4.9 | 0 | 0 | 0 | 5.1 | 5.1 | 5.1 | 1P | 2P | 0 | 2P | 1P | 0 | 2P | – | – | SCAN |
| IC105 | .5 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 11.2 | 0 | 11.2 | 11.2 | 11.2 | .1 | .1 | .1 | .1 | 5.1 | Manual |
| | 9P | 9P | 9P | 9P | 9P | 9P | 9P | 0 | 9P | 9P | 9P | 1P | 2P | 1P | 2P | 5.1 | SCAN |




**5 - 5-5 CRYSTAL LOCATION DIAGRAM**

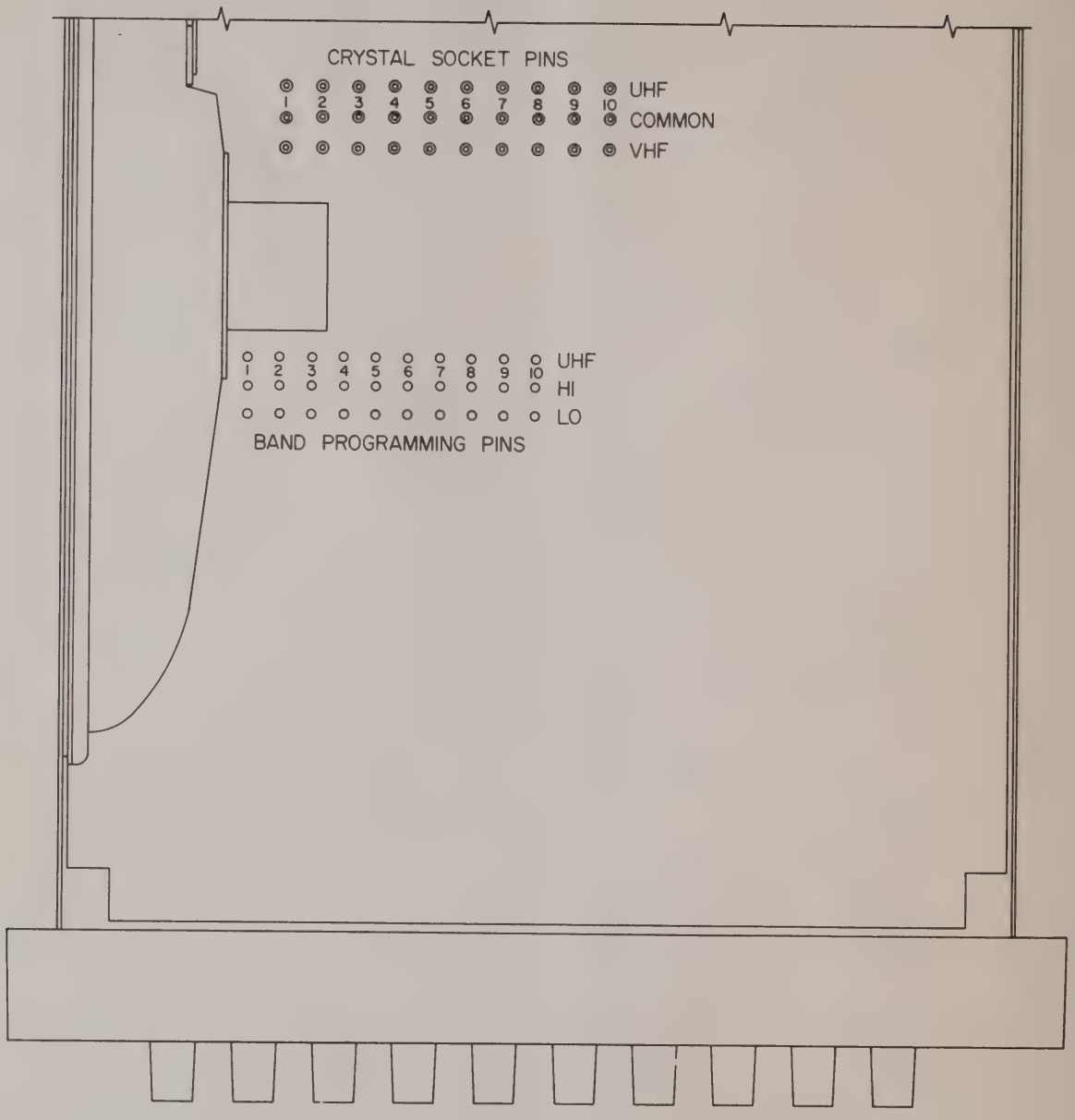



# ACT-R10 H/L/U

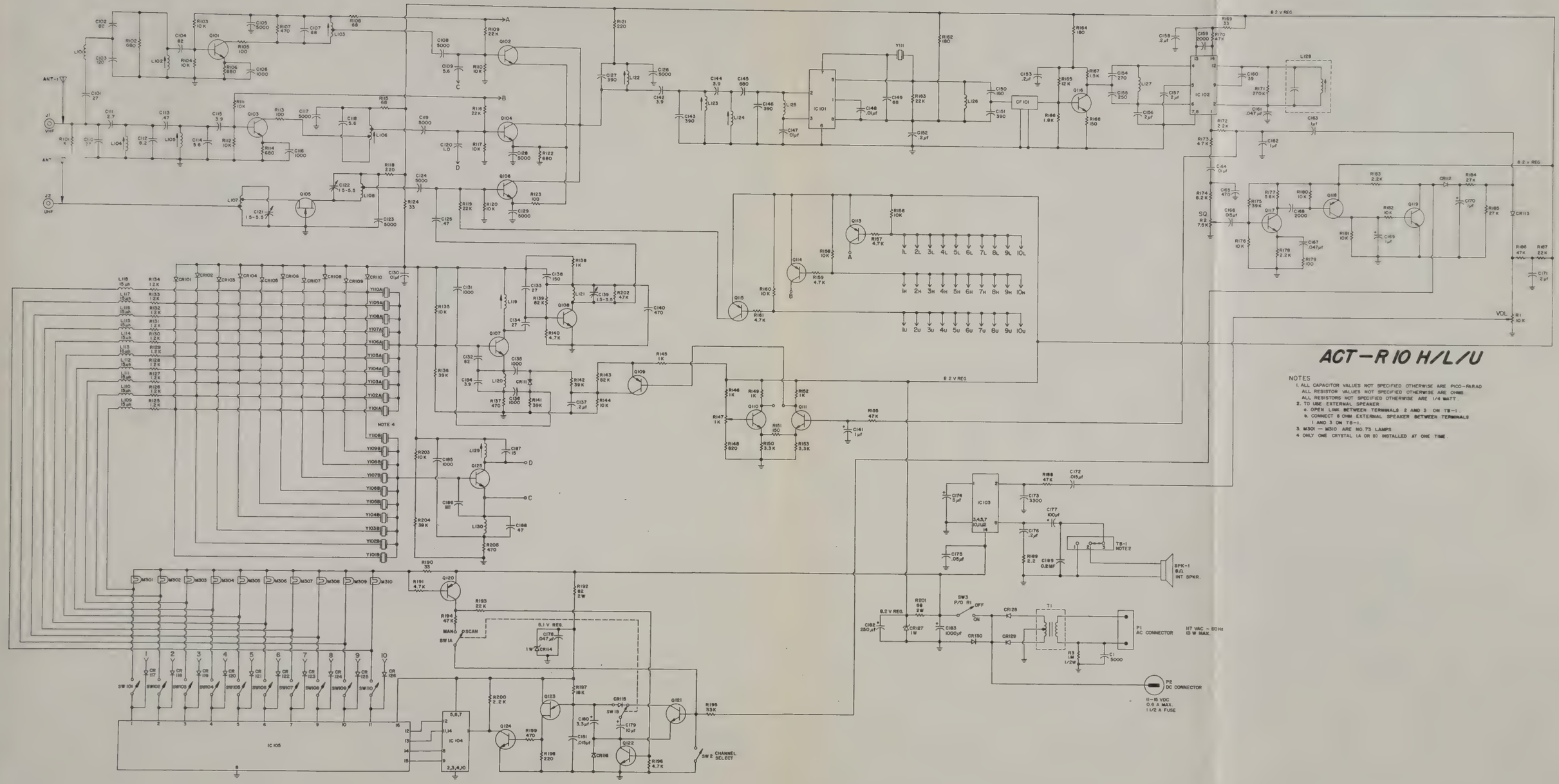
NOTES

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD
   ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS
   ALL RESISTORS NOT SPECIFIED OTHERWISE ARE 1/4 WATT
2. TO USE EXTERNAL SPEAKER
   a. OPEN LINK BETWEEN TERMINALS 2 AND 3 ON TB-1.
   b. CONNECT 8 OHM EXTERNAL SPEAKER BETWEEN TERMINALS 1 AND 3 ON TB-1.
3. M301 — M310 ARE NO.73 LAMPS.
4. ONLY ONE CRYSTAL (A OR B) INSTALLED AT ONE TIME.

## 5 - 5-6 SCHEMATIC




**5 - 5-5 CRYSTAL LOCATION DIAGRAM**


ACT-R10 H/L/U
NOTES
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a. OPEN LINK BETWEEN TERMINALS 2 AND 3 ON TB-1.
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3. M301 — M310 ARE NO. 73 LAMPS
4. ONLY ONE CRYSTAL (A OR B) INSTALLED AT ONE TIME.
8.2 V REG
5.1 V REG
ANT-1
ANT-2
J1 VHF
J2 UHF
IC 101
IC 102
IC 103
IC 104
IC 105
CF 101
SQ.
VOL
SW1A MAN SCAN
SW2 CHANNEL SELECT
SW3 P/O R1 OFF ON
P1 AC CONNECTOR
117 VAC ~ 60 Hz 13 W MAX.
P2 DC CONNECTOR
11-15 VDC 0.6 A MAX. 1 1/2 A FUSE
SPK-1 8Ω INT. SPKR.
TS-1 NOTE 2

## 5 - 5-6 SCHEMATIC

# 5-6 PARTS LIST

## 5 - 6-1 MAIN BOARD 700 - 164

| Item | Description | Part No. |
|---|---|---|
| | **RESISTORS** | |
| R101 | 1K, 10%, ¼W | 4701-0102-042 |
| R102 | 680 ohm, 10%, ¼W | 4701-0681-042 |
| R103 | 10K, 10%, ¼W | 4701-0103-042 |
| R104 | 10K, 10%, ¼W | 4701-0103-042 |
| R105 | 100 ohm, 10%, ¼W | 4701-0101-042 |
| R106 | 680 ohm, 10%, ¼W | 4701-0681-042 |
| R107 | 470 ohm, 10%, ¼W | 4701-0471-042 |
| R108 | 68 ohm, 10%, ¼W | 4701-0680-042 |
| R109 | 22K, 10%, ¼W | 4701-0223-042 |
| R110 | 10K, 10%, ¼W | 4701-0103-042 |
| R111 | 10K, 10%, ¼W | 4701-0103-042 |
| R112 | 10K, 10%, ¼W | 4701-0103-042 |
| R113 | 100 ohm, 10%, ¼W | 4701-0101-042 |
| R114 | 680 ohm, 10%, ¼W | 4701-0681-042 |
| R115 | 68 ohm, 10%, ¼W | 4701-0680-042 |
| R116 | 22K, 10%, ¼W | 4701-0223-042 |
| R117 | 10K, 10%, ¼W | 4701-0103-042 |
| R118 | 220 ohm, 10%, ¼W | 4701-0221-042 |
| R119 | 22K, 10%, ¼W | 4701-0223-042 |
| R120 | 10K, 10%, ¼W | 4701-0103-042 |
| R121 | 220 ohm, 10%, ¼W | 4701-0221-042 |
| R122 | 680 ohm, 10%, ¼W | 4701-0681-042 |
| R123 | 100 ohm, 10%, ¼W | 4701-0101-042 |
| R124 | 33 ohm, 10%, ¼W | 4701-0330-042 |
| R125 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R126 | 1.2 K, 10%, ¼W | 4701-0122-042 |
| R127 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R128 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R129 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R130 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R131 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R132 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R133 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R134 | 1.2K, 10%, ¼W | 4701-0122-042 |
| R135 | 10K, 10%, ¼W | 4701-0103-042 |
| R136 | 39K, 10%, ¼W | 4701-0393-042 |
| R137 | 470 ohm, 10%, ¼W | 4701-0471-042 |
| R138 | 1K, 10%, ¼W | 4701-0102-042 |
| R139 | 82K, 10%, ¼W | 4701-0823-042 |
| R140 | 4.7K, 10%, ¼W | 4701-0472-042 |
| R141 | 39K, 10%, ¼W | 4701-0393-042 |
| R142 | 39K, 10%, ¼W | 4701-0393-042 |
| R143 | 82K, 10%, ¼W | 4701-0823-042 |
| R144 | 10K, 10%, ¼W | 4701-0103-042 |
| R145 | 1K, 10%, ¼W | 4701-0102-042 |
| R146 | 1K, 10%, ¼W | 4701-0102-042 |
| R147 | 1K, Trimmer (Vert.) | 4751-0102-005 |
| R148 | 820 ohm, 10%, ¼W | 4701-0821-042 |
| R149 | 1K, 10%, ¼W | 4701-0102-042 |
| R150 | 3.3K, 10%, ¼W | 4701-0332-042 |
| R151 | 150 ohm, 10%, ¼W | 4701-0151-042 |
| R152 | 1K, 10%, ¼W | 4701-0102-042 |
| R153 | 3.3K, 10%, ¼W | 4701-0332-042 |
| R155 | 47K, 10%, ¼W | 4701-0473-042 |
| R156 | 10K, 10%, ¼W | 4701-0103-042 |
| R157 | 4.7K, 10%, ¼W | 4701-0472-042 |
| R158 | 10K, 10%, ¼W | 4701-0103-042 |
| R159 | 4.7K, 10%, ¼W | 4701-0472-042 |
| R160 | 10K, 10%, ¼W | 4701-0103-042 |
| R161 | 4.7K, 10%, ¼W | 4701-0472-042 |
| R162 | 180 ohm, 10%, ¼W | 4701-0181-042 |
| R163 | 22K, 10%, ¼W | 4701-0223-042 |
| R164 | 180 ohm, 10%, ¼W | 4701-0181-042 |
| R165 | 12K, 10%, ¼W | 4701-0123-042 |
| R166 | 1.8K, 10%, ¼W | 4701-0182-042 |
| R167 | 1.5K, 10%, ¼W | 4701-0152-042 |
| R168 | 150 ohm, 10%, ¼W | 4701-0151-042 |
| R169 | 33 ohm, 10%, ¼W | 4701-0330-042 |
| R170 | 47K, 10%, ¼W | 4701-0473-042 |
| R171 | 270K, 10%, ¼W | 4701-0274-042 |
| R172 | 2.2K, 10%, ¼W | 4701-0222-042 |
| R173 | 4.7K, 10%, ¼W | 4701-0472-042 |
| R174 | 8.2K, 10%, ¼W | 4701-0822-042 |
| R175 | 39K, 10%, ¼W | 4701-0393-042 |
| R176 | 10K, 10%, ¼W | 4701-0103-042 |
| R177 | 5.6K, 10%, ¼W | 4701-0562-042 |
| R178 | 2.2K, 10%, ¼W | 4701-0222-042 |
| R179 | 100 ohm, 10%, ¼W | 4701-0101-042 |
| R180 | 10K, 10%, ¼W | 4701-0103-042 |
| R181 | 10K, 10%, ¼W | 4701-0103-042 |
| R182 | 10K, 10%, ¼W | 4701-0103-042 |
| R183 | 2.2K, 10%, ¼W | 4701-0222-042 |
| R184 | 27K, 10%, ¼W | 4701-0273-042 |
| R185 | 27K, 10%, ¼W | 4701-0273-042 |
| R186 | 47K, 10%, ¼W | 4701-0473-042 |
| R187 | 22K, 10%, ¼W | 4701-0223-042 |
| R188 | 47K, 10%, ¼W | 4701-0473-042 |
| R189 | 2.2 ohm, 10%, ¼W | 4701-0229-042 |
| R190 | 33 ohm, 10%, ¼W | 4701-0330-042 |
| R191 | 4.7K, 10%, ¼W | 4701-0472-042 |
| R192 | 82 ohm, 5%, 2W | 4710-0820-031 |
| R193 | 22K, 10%, ¼W | 4701-0223-042 |
| R194 | 47K, 10%, ¼W | 4701-0473-042 |
| R195 | 33K, 10%, ¼W | 4701-0333-042 |
| R196 | 18K, 10%, ¼W | 4701-0183-042 |
| R197 | 18K, 10%, ¼W | 4701-0183-042 |
| R198 | 220 ohm, 10%, ¼W | 4701-0221-042 |
| R199 | 470 ohm, 10%, ¼W | 4701-0471-042 |
| R200 | 2.2K, 10%, ¼W | 4701-0222-042 |
| R201 | 68 ohm, 5%, 2W | 4710-0680-031 |
| R202 | 4.7K, 10%, ¼W | 4701-0472-042 |
| R203 | 10K, 10%, ¼W | 4701-0103-042 |
| R204 | 39K, 10%, ¼W | 4701-0393-042 |
| R205 | 470 ohm, 10%, ¼W | 4701-0471-042 |
| | **CAPACITORS** | |
| C101 | 27Pf, 10%, NPO, 50v (Disc) | 1500-0270-650 |
| C102 | 82Pf, 5%, NPO, 50v (Disc) | 1524-0820-002 |
| C103 | 120Pf, 5%, 50v (Mica) | 1506-0121-550 |
| C104 | 82Pf, 5%, NPO, 50v (Disc) | 1524-0820-002 |
| C105 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C106 | .001 mfd, +80 -20%, 500v (Disc) | 1503-0102-001 |
| C107 | 68Pf, 5%, NPO, 50v (Disc) | 1524-0680-002 |
| C108 | .005. mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C109 | 5.6Pf, 10%, NPO, 500v (Disc) | 1500-0569-905 |
| C110 | 27Pf, 10%, NPO, 50v (Disc) | 1500-0270-650 |
| C111 | 2.7Pf, +/-.25Pf, NPO, 500v (Disc) | 1500-0279-205 |
| C112 | 8.2Pf, 10%, NPO, 500v (Disc) | 1500-0829-905 |
| C113 | .47Pf, 10%, (Composition) | 1510-0478-900 |
| C114 | 5.6Pf, 10%, NPO, 500v (Disc) | 1500-0569-905 |
| C115 | 3.9Pf, 10%, NPO, 500v (Disc) | 1500-0399-905 |
| C116 | .001 mfd, +80 -20%, 500v (Disc) | 1503-0102-001 |
| C117 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C118 | 5.6Pf, 10%, NPO, 500v (Disc) | 1500-0569-905 |
| C119 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C120 | 1Pf, 10%, (Composition) | 1510-0010-900 |
| C121 | 1.5 - 5.5Pf, Trimmer | 1517-0000-011 |
| C122 | 1.5 - 5.5Pf, Trimmer | 1517-0000-011 |
| C123 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C124 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C125 | .47Pf, 10%, (Composition) | 1510-0478-900 |
| C126 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C127 | 390Pf, 5%, 50v (Mica) | 1506-0391-550 |

| Item | Description | Part No. |
|---|---|---|
| C128 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C129 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C130 | .01 mfd, +80 -20%, 500v (Disc) | 1502-0103-001 |
| C131 | .001 mfd, +80 -20%, 500v (Disc) | 1503-0102-001 |
| C132 | 82Pf, 5%, NPO, 50v (Disc) | 1524-0820-002 |
| C133 | 27Pf, 10%, NPO, 50v (Disc) | 1500-0270-650 |
| C134 | 27Pf, 10%, NPO, 50v (Disc) | 1500-0270-650 |
| C135 | .001 mfd, +80 -20%, 500v (Disc) | 1503-0102-001 |
| C136 | .001 mfd, +80 -20%, 500v (Disc) | 1503-0102-001 |
| C137 | .2 mfd, +80 -20%, 12v (Disc) | 1502-0204-006 |
| C138 | 150Pf, 20%, 50v (Disc) | 1523-0151-002 |
| C139 | 1.5 - 5.5Pf, Trimmer | 1517-0000-011 |
| C140 | 470Pf, 20%, 50v (Disc) | 1523-0471-002 |
| C141 | 1 mfd, 16v 85°C (Electrolytic) | 1513-0010-002 |
| C142 | 3.9Pf, 10% (Composition) | 1510-0399-900 |
| C143 | 390Pf, 5%, 50v (Mica) | 1506-0391-550 |
| C144 | 3.9Pf, 10%, NPO, 500v (Disc) | 1500-0399-905 |
| C145 | 680Pf, 5%, 50v (Mica) | 1506-0681-550 |
| C146 | 390Pf, 5%, 50v (Mica) | 1506-0391-550 |
| C147 | .005 mfd, +80 -20%, 500v (Disc) | 1503-0502-002 |
| C148 | .01 mfd, +80 -20%, 25v (Disc) | 1502-0103-004 |
| C149 | 68Pf, 5%, NPO, 50v (Disc) | 1524-0680-002 |
| C150 | 180Pf, 5%, 50v (Mica) | 1506-0181-550 |
| C151 | 390Pf, 5%, 50v (Mica) | 1506-0391-550 |
| C152 | .2 mfd, +80 -20%, 12v (Disc) | 1502-0204-006 |
| C153 | .2 mfd, +80 -20%, 12v (Disc) | 1502-0204-006 |
| C154 | 270Pf, 5%, 50v (Mica) | 1506-0271-550 |
| C155 | 250Pf, 5%, 50v (Mica) | 1506-0251-550 |
| C156 | .2 mfd, +80 -20%, 12v (Disc) | 1502-0204-006 |
| C157 | .2 mfd, +80 -20%, 12v (Disc) | 1502-0204-006 |
| C158 | .2 mfd, +80 -20%, 12v (Disc) | 1502-0204-006 |
| C159 | .002 mfd, 20%, 50v (Disc) | 1523-0202-002 |
| C160 | 39Pf, 10%, NPO, 50v (Disc) | 1500-0390-650 |
| C161 | .047 mfd, 10%, 100v (Mylar film) | 1508-0473-610 |
| C162 | .1 mfd, 20%, 12v (Disc) | 1502-0104-005 |
| C163 | .1 mfd, 20%, 12v (Disc) | 1502-0104-005 |
| C164 | .01 mfd, 10%, 100v (Mylar film) | 1508-0103-610 |
| C165 | 470Pf, 20%, 50v (Disc) | 1523-0471-002 |
| C166 | .015 mfd, 10%, 100v (Mylar film) | 1508-0153-610 |
| C167 | .047 mfd, 10%, 100v (Mylar film) | 1508-0473-610 |
| C168 | .002 mfd, 20%, 50v (Disc) | 1523-0202-002 |
| C169 | 1 mfd, 16v, 85°C (Electrolytic) | 1513-0010-002 |
| C170 | 1 mfd, 16v, 85°C (Electrolytic) | 1513-0010-002 |
| C171 | .2 mfd, +80 -20%, 12v (Disc) | 1502-0204-006 |
| C172 | .015 mfd, 10%, 100v (Mylar film) | 1508-0153-610 |
| C173 | .0033 mfd, 10%, 100v (Mylar film) | 1508-0332-610 |
| C174 | 5 mfd, 10v, 85°C (Electrolytic) | 1513-0050-001 |
| C175 | .05 mfd, +80 -20%, 25v (Disc) | 1502-0503-004 |
| C176 | .2 mfd, +80 -20%, 12v (Disc) | 1502-0204-006 |
| C177 | 100 mfd, 16v, 85°C (Electrolytic) | 1513-0101-002 |
| C178 | .047 mfd, 10%, 100v (Mylar film) | 1508-0473-610 |
| C179 | 10 mfd, 10v, 85°C (Electrolytic) | 1513-0100-001 |
| C180 | 3.3 mfd, 20%, 10v, 85°C (Electrolyt.) | 1513-0339-005 |
| C181 | .015 mfd, 10%, 100v (Mylar film) | 1508-0153-610 |
| C182 | 250 mfd, 10v, 85°C (Electrolytic) | 1513-0251-001 |
| C183 | 1000 mfd, 16v, 85°C (Electrolytic) | 1513-0102-002 |
| C184 | 3.9Pf, 10%, NPO, 500v (Disc) | 1500-0399-905 |
| C185 | .001 mfd, +80 -20%, 500v (Disc) | 1503-0102-001 |
| C186 | 82Pf, 5%, NPO, 50v (Disc) | 1524-0820-002 |
| C187 | 15Pf, 10%, NPO, 50v (Disc) | 1500,0150-650 |
| C188 | 47pf, 5%, NPO, 50V (Disc.) | 1524-0470-002 |
| C189 | 0.2 mfd, +80 -20%, 12V (Disc.) | 1502-0204-006 |

### COILS

| | | |
|---|---|---|
| L101 | Choke, .68 mhy | 1802-0688-003 |
| L102 | Input, RF AMP (Green) | 1800-3152-005 |
| L103 | Output, RF AMP (Yellow) | 1800-3152-004 |
| L104 | Input, RF AMP (Red) | 1800-3152-002 |
| L105 | Input, RF AMP (Red) | 1800-3152-002 |
| L106 | Output, RF AMP (Orange) | 1800-3152-003 |
| L107 | Input, RF AMP (UHF) | 1800-3160-001 |
| L108 | Output, RF AMP (UHF) | 1800-3160-002 |
| L109 | Choke, 15 mhy | 1802-0152-004 |
| L110 | Choke, 15 mhy | 1802-0152-004 |
| L111 | Choke, 15 mhy | 1802-0152-004 |
| L112 | Choke, 15 mhy | 1802-0152-004 |
| L113 | Choke, 15 mhy | 1802-0152-004 |
| L114 | Choke, 15 mhy | 1802-0152-004 |
| L115 | Choke, 15 mhy | 1802-0152-004 |
| L116 | Choke, 15 mhy | 1802-0152-004 |
| L117 | Choke, 15 mhy | 1802-0152-004 |
| L118 | Choke, 15 mhy | 1802-0152-004 |
| L119 | Oscillator, collector (White) | 1800-3152-009 |
| L120 | Oscillator, emitter | 1801-1236-900 |
| L121 | Tripler, collector | 1800-3160-003 |
| L122 | 10.7 MHz IF (White) | 1800-3191-401 |
| L123 | 10.7 MHz IF (White) | 1800-3191-401 |
| L124 | 10.7 MHz IF (Yellow) | 1800-3191-402 |
| L125 | Choke, 6.8 mhy, 10% | 1802-0689-003 |
| L126 | Choke, 820 mhy | 1802-0000-002 |
| L127 | Choke, 820 mhy | 1802-0000-002 |
| L128 | Quadrature Detector | 1800-3151-700 |
| L129 | Oscillator, collector (White) | 1800-3152-009 |

### DIODES

| | | |
|---|---|---|
| CR101 | Germanium - junction, signal | 4807-1233-900 |
| CR102 | Germanium - junction, signal | 4807-1233-900 |
| CR103 | Germanium - junction, signal | 4807-1233-900 |
| CR104 | Germanium - junction, signal | 4807-1233-900 |
| CR105 | Germanium - junction, signal | 4807-1233-900 |
| CR106 | Germanium - junction, signal | 4807-1233-900 |
| CR107 | Germanium - junction, signal | 4807-1233-900 |
| CR108 | Germanium - junction, signal | 4807-1233-900 |
| CR109 | Germanium - junction, signal | 4807-1233-900 |
| CR110 | Germanium - junction, signal | 4807-1233-900 |
| CR111 | Varactor, SMV 1172 | 4809-0000-001 |
| CR112 | Silicon, signal | 4805-1241-200 |
| CR113 | Silicon, signal | 4805-1241-200 |
| CR114 | Zener, 5.1v, 5%, 1W | 4808-0000-007 |
| CR115 | Silicon, signal | 4805-1241-200 |
| CR116 | Silicon, signal | 4805-1241-200 |
| CR117 | Silicon, signal | 4805-1241-200 |
| CR118 | Silicon, signal | 4805-1241-200 |
| CR119 | Silicon, signal | 4805-1241-200 |
| CR120 | Silicon, signal | 4805-1241-200 |
| CR121 | Silicon, signal | 4805-1241-200 |
| CR122 | Silicon, signal | 4805-1241-200 |
| CR123 | Silicon, signal | 4805-1241-200 |
| CR124 | Silicon, signal | 4805-1241-200 |
| CR125 | Silicon, signal | 4805-1241-200 |
| CR126 | Silicon, signal | 4805-1241-200 |
| CR127 | Zener, 8.2v, 5%, 1W | 4808-0000-009 |
| CR128 | Silicon, Rectifier | 4806-0000-004 |
| CR129 | Silicon, Rectifier | 4806-0000-004 |
| CR130 | Silicon, Rectifier | 4806-0000-004 |

### TRANSISTORS

| | | |
|---|---|---|
| Q101 | Silicon, NPN (Red top) | 4801-0000-035 |
| Q102 | Silicon, NPN (Red top) | 4801-0000-035 |
| Q103 | Silicon, NPN (Red top) | 4801-0000-035 |
| Q104 | Silicon, NPN (Red top) | 4801-0000-035 |
| Q105 | Field Effect, junction | 4811-0000-015 |

| Item | Description | Part No. |
|---|---|---|
| Q106 | Silicon, NPN (Red top) | 4801-0000-035 |
| Q107 | Silicon, NPN | 4801-0000-100 |
| Q108 | Silicon, NPN (Red top) | 4801-0000-035 |
| Q109 | Silicon, PNP (White top) | 4801-0000-060 |
| Q110 | Silicon, NPN | 4801-0000-010 |
| Q111 | Silicon, NPN | 4801-0000-010 |
| Q113 | Silicon, PNP (White top) | 4801-0000-060 |
| Q114 | Silicon, PNP (White top) | 4801-0000-060 |
| Q115 | Silicon, PNP (White top) | 4801-0000-060 |
| Q116 | Silicon, NPN | 4801-0000-010 |
| Q117 | Silicon, NPN | 4801-0000-010 |
| Q118 | Silicon, PNP (White top) | 4801-0000-060 |
| Q119 | Silicon, NPN | 4801-0000-010 |
| Q120 | Silicon, PNP (White top) | 4801-0000-060 |
| Q121 | Silicon, NPN | 4801-0000-010 |
| Q122 | Silicon, NPN | 4801-0000-010 |
| Q123 | Silicon, PN, Unijunction | 4813-0000-001 |
| Q124 | Silicon, NPN | 4801-0000-010 |
| Q125 | Silicon, NPN | 4801-0000-100 |
| | **INTEGRATED CIRCUITS** | |
| IC101 | IF Amplifier | 3130-3167-901 |
| IC102 | Limiter/Quadrature Detector | 3130-3157-603 |
| IC103 | Audio Amplifier | 3130-3157-614 |
| IC104 | Counter | 3130-3157-608 |
| IC105 | Decoder/Driver | 3130-3193-501 |
| | **CRYSTAL** | |
| Y111 | 10.245 MHz (Standard) | 2301-3151-601 |
| Y111 | 11.155 MHz (Special) | 2301-3151-602 |
| | **FILTER** | |
| CF101 | Ceramic, 455 KHz | 2700-0000-007 |
| | **MISCELLANEOUS** | |
| | Socket Pin, Crystal Mounting | 2830-3216-400 |
| | Terminal, Female (PC Mount) | 2106-0000-002 |
| | Terminal, Male (PC Mount) | 2107-0000-003 |
| | Terminal, Female (Wire Mount) | 2107-0000-001 |
| | Connector, 11 - pin, PC Mount | 2105-0000-014 |
| | Shield (Straight Section) | 2508-1256-300 |
| | Shield (L-shaped Section) | 2508-1256-400 |
| | Switch (10 Position) | 5112-6038-401 |